TOSHIBA

FILE NO.SVM-05019

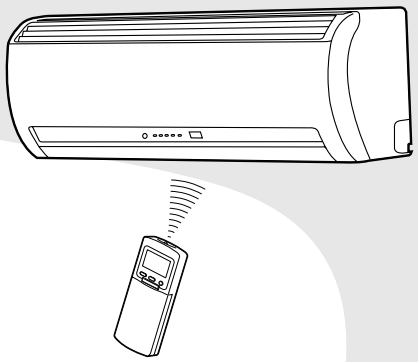
SERVICE MANUAL

AIR-CONDITIONER
SPLIT TYPE

RAS-M10NKV-E, RAS-M13NKV-E, RAS-M16NKV-E

RAS-M10NKCV-E, RAS-M13NKCV-E, RAS-M16NKCV-E

(This service manual provide information only on the indoor units. For information on the outdoor unit please refer to the service manual of the outdoor unit.)



HFC

R410A

May, 2005

CONTENTS

1. Specifications
2. Construction Views
3. Wiring Diagram
4. Specifications of Electrical Parts (Indoor unit only)
5. Control Block Diagram (Indoor unit only)
6. Operation Description
7. Installation Procedure
8. How to Diagnose the trouble
9. How to Replace the main parts (Indoor unit only)
10. Exploded Views and Parts list (Indoor unit only)

1. SPECIFICATIONS

Specifications

RAS-M10NKV-E, RAS-M13NKV-E, RAS-M16NKV-E

Power supply			220/230/240V, 1Ph, 50/60Hz		
Electric characteristice	Unit model		**RAS-M10NKV-E**	**RAS-M13NKV-E**	**RAS-M16NKV-E**
	Running current	(A)	0.15	0.15	0.15
	Power consumption	(W)	30	30	30
	Power factor	(%)	87	87	87
Operating noise	High	dB (A)	36/39	39/40	42/42
	Medium	dB (A)	33/35	35/35	39/39
	Low	dB (A)	28/29	28/29	33/33
Dimension	Height	(mm)	275	275	275
	Width	(mm)	790	790	790
	Depth	(mm)	218	218	218
Net weight		(kg)	10	10	10
Fan motor output		(W)	20	20	30
Air flow rate (Cooling/Heating)		(m3/h)	570/610	590/620	650/660
Piping connection	Type		Flare connection		
	Liquid side		∅6.35	∅6.35	∅6.35
	Gas side		∅9.52	∅9.52	∅12.7
Refrigerant			R410A		
Wiring connection (Interconnection)			4 wires : includes earth		

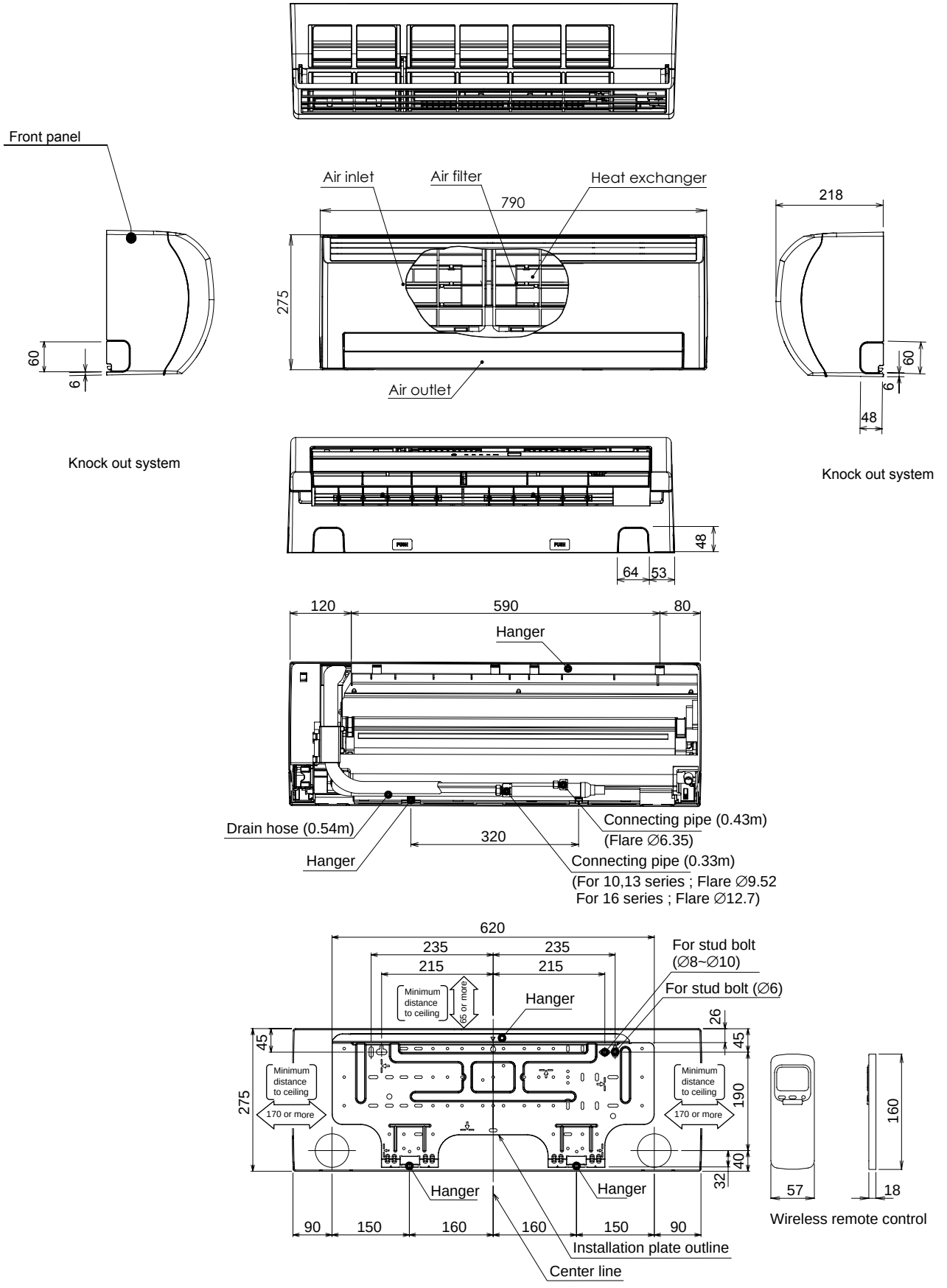
RAS-M10NKCV-E, RAS-M13NKCV-E, RAS-M16NKCV-E

Power supply			220/230/240V, 1Ph, 50/60Hz		
Electric characteristice	Unit model		**RAS-M10NKCV-E**	**RAS-M13NKCV-E**	**RAS-M16NKCV-E**
	Running current	(A)	0.15	0.15	0.15
	Power consumption	(W)	30	30	30
	Power factor	(%)	87	87	87
Operating noise	High	dB (A)	36	39	42
	Medium	dB (A)	33	35	39
	Low	dB (A)	28	28	33
Dimension	Height	(mm)	275	275	275
	Width	(mm)	790	790	790
	Depth	(mm)	218	218	218
Net weight		(kg)	10	10	10
Fan motor output		(W)	20	20	30
Air flow rate		(m3/h)	570	590	650
Piping connection	Type		Flare connection		
	Liquid side		∅6.35	∅6.35	∅6.35
	Gas side		∅9.52	∅9.52	∅12.7
Refrigerant			R410A		
Wiring connection (Interconnection)			4 wires : includes earth		

- The specifications may be subject to change without notice for purpose of improvement.

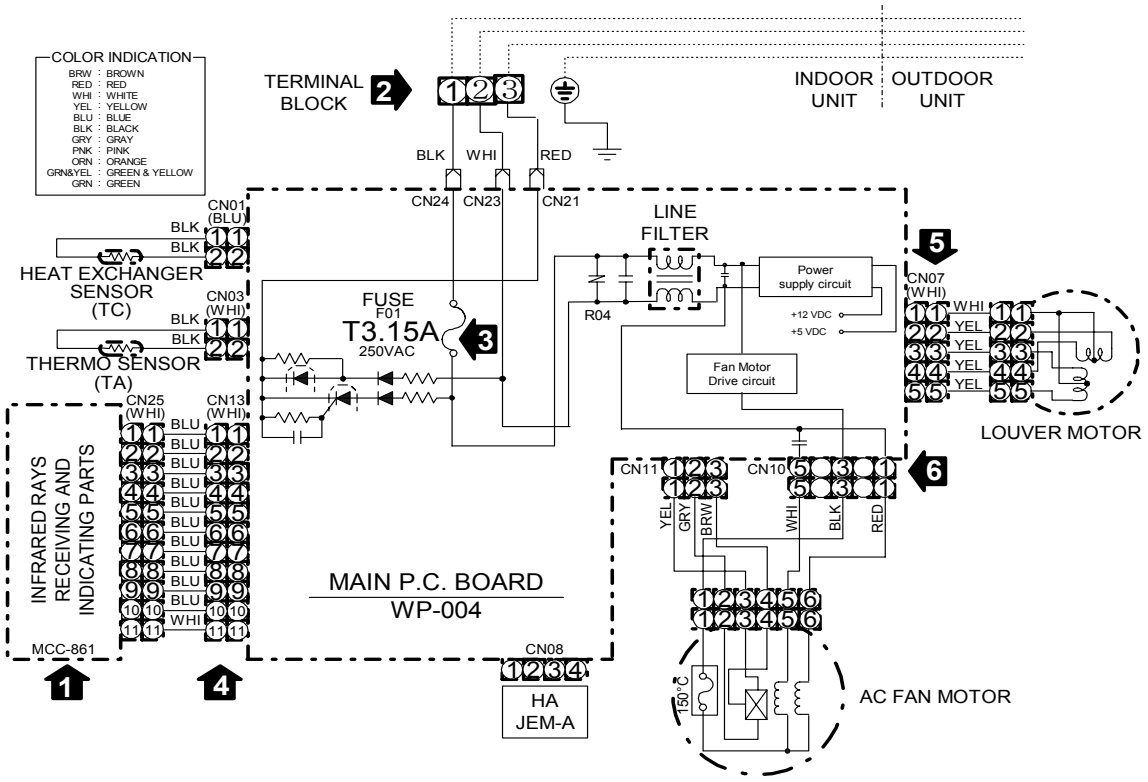
2. CONSTRUCTION VIEWS

Indoor Unit



3. WIRING DIAGRAM

3-1. Indoor Unit (For 10k & 13k)

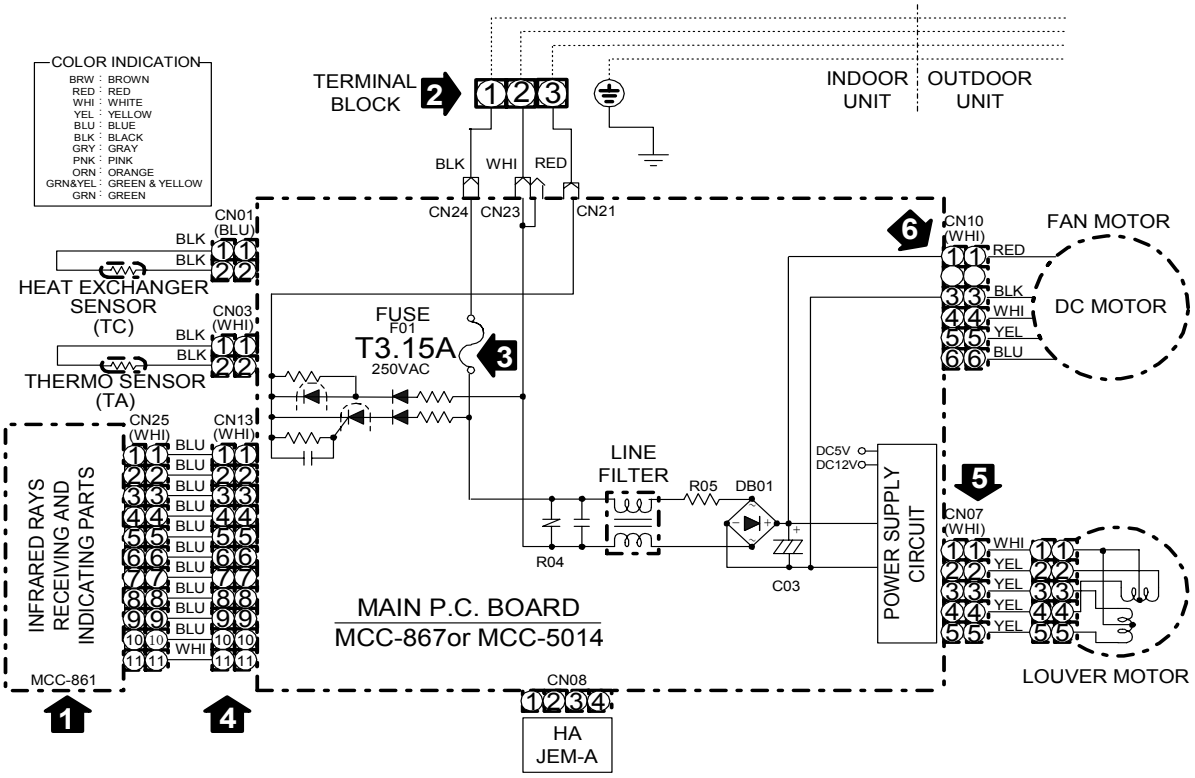


Simple Check for Failure Diagnosis

Check Item	Diagnosis Result
1 OPERATION INDICATOR	Check to see if the OPERATION indicator goes on and off when the main switch or breaker is turned on. (Check the primary and secondary voltage of the transformer.)
2 TERMINAL BLOCK	Check the power supply voltage between ① and ②. (Refer to the name plate.) (Check the primary and secondary voltage of the transformer.) Check the fluctuating voltage between ② and ③. (15~60VDC)
3 FUSE 3.15A	Check to see if the fuse blows out. (Check the R04 of the varistor.)
4 DC5V	Check the voltage at the No.4 pin on CN13 connector of the infrared receiver. (Check the transformer and the power supply circuit of the rated voltage.)
5 DC12V	Check the voltage at the white lead of the louver motor. (Check the transformer and the power supply circuit of the rated voltage.)
6 (AC 220~240V)	Check the voltage at the No.1 pin on CN10 connector and CN24. (Check the F01)

Refer to the service data for the detailed failure diagnosis.

3-2. Indoor Unit (For 16k)



Simple Check for Failure Diagnosis

Check Item	Diagnosis Result
1 OPERATION INDICATOR	Check to see if the OPERATION indicator goes on and off when the main switch or breaker is turned on. (Check the primary and secondary voltage of the transformer.)
2 TERMINAL BLOCK	Check the power supply voltage between ① and ②. (Refer to the name plate.) (Check the primary and secondary voltage of the transformer.) Check the fluctuating voltage between ② and ③. (15～60VDC)
3 FUSE 3.15A	Check to see if the fuse blows out. (Check the R04 of the varistor.)
4 DC5V	Check the voltage at the No.4 pin on CN13 connector of the infrared receiver. (Check the transformer and the power supply circuit of the rated voltage.)
5 DC12V	Check the voltage at the white lead of the louver motor. (Check the transformer and the power supply circuit of the rated voltage.)
6 DC325V (DC310～340V)	Check the voltage at the No.1 pin on CN10 connector. (Check the DB01, R05 and C03.)

Refer to the service data for the detailed failure diagnosis.

4. SPECIFICATIONS OF ELECTRICAL PARTS

RAS-M10NKV-E, RAS-M13NKV-E
RAS-M10NKCV-E, RAS-M13NKCV-E

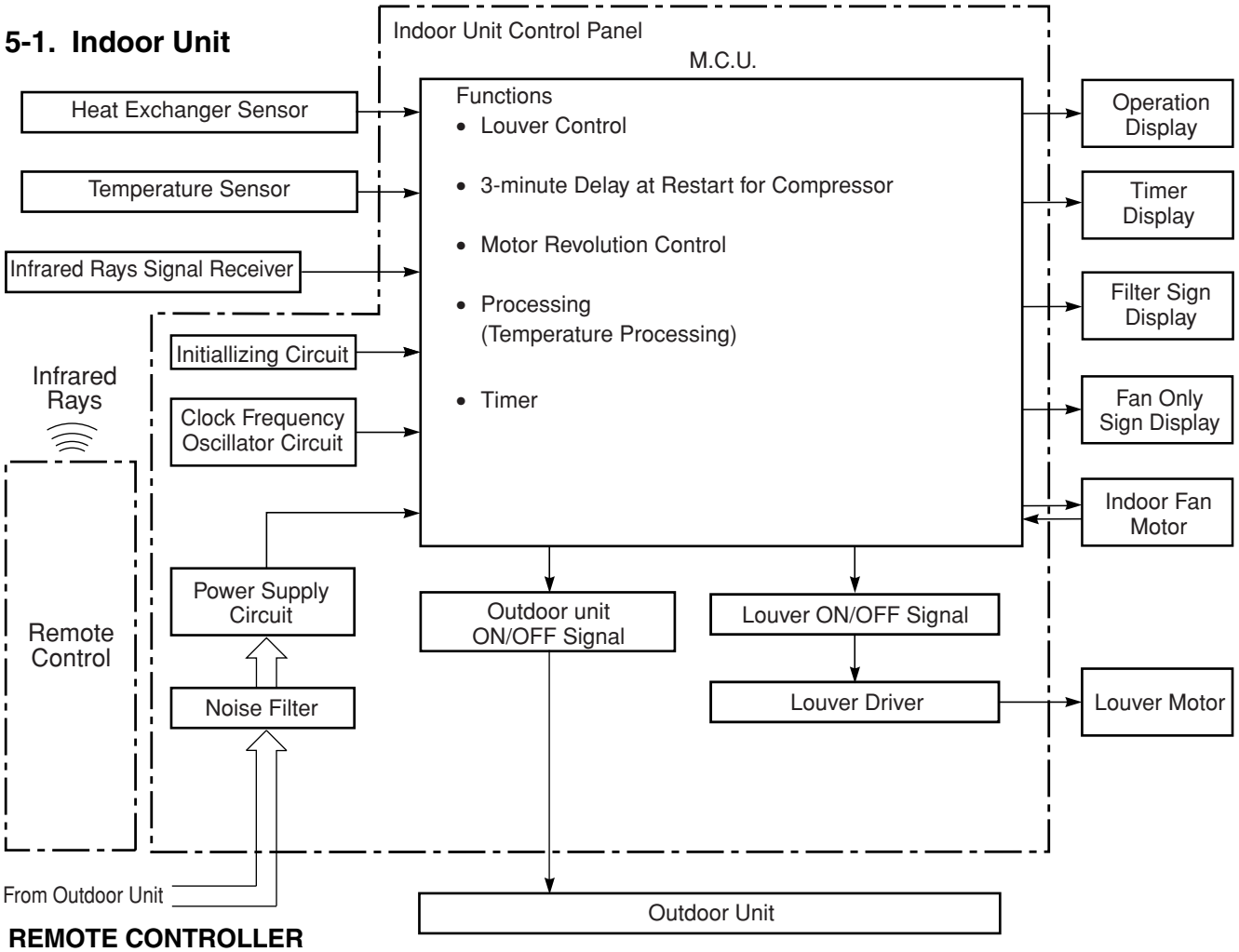
No.	Parts name	Type	Specifications
1	Fan motor (for indoor)	SKF-220-20-4A-1	AC Motor with 150°C thermo fuse
2	Thermo. sensor (TA-sensor)	———	10 kΩ at 25°C
3	AC-AC transformer (T01)	TT-10	187 – 276V, 6VA
4	Microcomputer	μPD780024AGK	
5	Heat exchanger sensor (TC-sensor)	———	10 kΩ at 25°C
6	Line filter (L01)	SS11V-06270	27 μH , AC 0.64A
7	Diode (DB01)	KBP06M	1.5A, 420V
8	Capacitor (C50)	LXV35VB2200MJ20	2200 μF, 35V
9	Fuse (F01)	BET 3.15A 250VAC	T3.15A, 250 V
10	Regulator IC (IC08)	NJM7812	12VDC, 1.5A max
11	Regulator IC (IC11)	NJM7805	5VDC, 1.5A max
12	Varistor (R21, R109)	15G561K	560 V
13	Louver motor	24BYJ48	DC 12V

RAS-M16NKV-E, RAS-M16NKCV-E

No.	Parts name	Type	Specifications
1	Fan motor (for indoor)	ICF-340-30-2	DC 340 V, 30 W
2	Thermo. sensor (TA-sensor)	———	10 kΩ at 25°C
3	DC-DC transformer (T01)	SWT-70	DC 390 V, Secondary DC 15 V, 12 V, 7 V
4	Microcomputer	μPD780024AGK	
5	Heat exchanger sensor (TC-sensor)	———	10 kΩ at 25°C
6	Line filter (L01)	SS11V-06270	27mH, AC 0.6A
7	Diode (DB01)	D3SBA60	4A, 600 V
8	Capacitor (C03)	KMH450VSSN120M25C	120μF, 450 V
9	Fuse (F01)	FCU250V, 3.15A	T3.15A, 250 V
10	Power supply IC (IC01)	STR-L472	
11	Varistor (R21, R109)	15G561K	560 V
12	Resistor (R01)	RF-5TK4R7	4.7Ω, 5 W
13	Louver motor	24BYJ48	12VDC

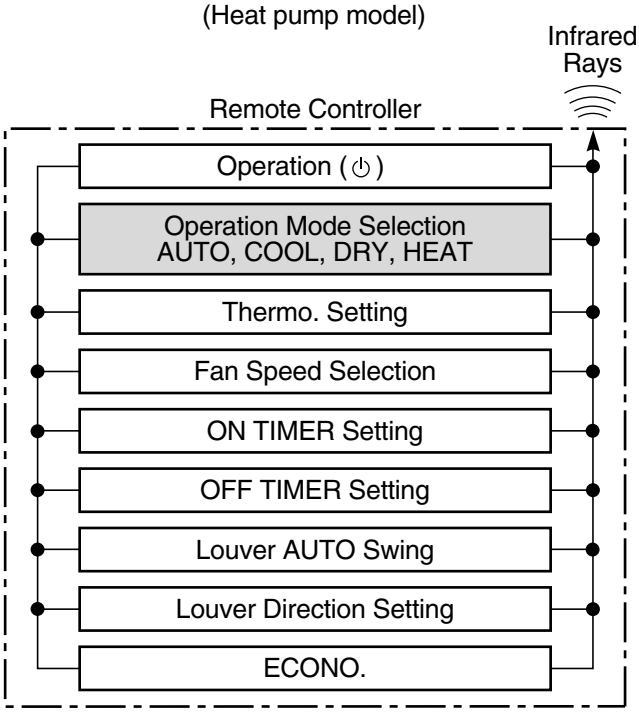
5. CONTROL BLOCK DIAGRAM

5-1. Indoor Unit

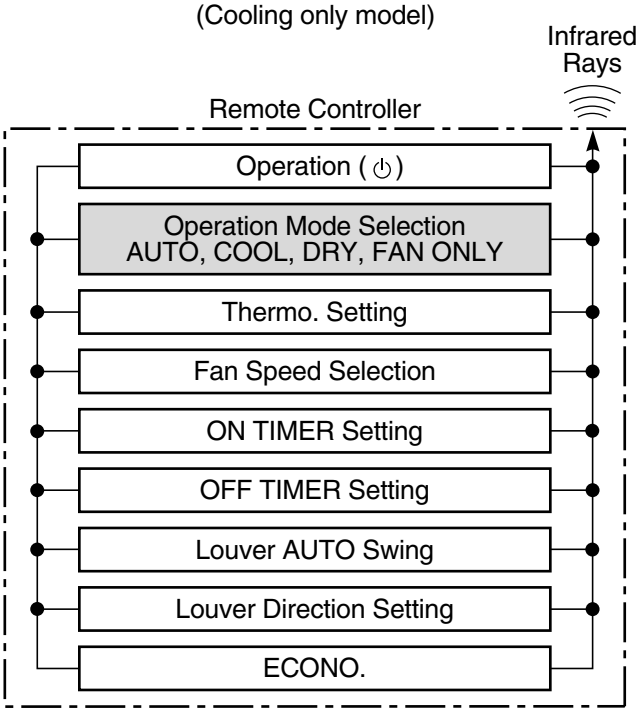


REMOTE CONTROLLER

RAS-M10NKV-E, RAS-M13NKV-E, RAS-M16NKV-E
(Heat pump model)



RAS-M10NKCV-E, RAS-M13NKCV-E, RAS-M16NKCV-E
(Cooling only model)



6. OPERATION DESCRIPTION

6-1. Outline of Air Conditioner Control

This air conditioner is a capacity-variable type air conditioner. The capacity proportional control compressor which can change the motor speed is mounted. The indoor unit motor drive circuit is mounted to the indoor unit. The compressor and the inverter to control outdoor unit motor are mounted to the outdoor unit. The entire air conditioner is mainly controlled by the indoor unit controller.

The indoor unit controller drives the indoor fan motor based upon command sent from the remote controller, and transfers the operation command to the outdoor unit controller.

The outdoor unit controller receives operation command from the indoor unit side, and controls the outdoor fan and the pulse modulating valve.

Besides, detecting revolution position of the compressor motor, the outdoor unit controller controls speed of the compressor motor by controlling output voltage of the inverter and switching timing of the supply power (current transfer timing) so that motors drive according to the operation command.
And then, the outdoor unit controller transfers reversely the operating status information of the outdoor unit to control the indoor unit controller.

As the compressor adopts four-pole brushless DC motor, the frequency of the supply power from inverter to compressor is two-times cycles of the actual number of revolution.

(1) Role of indoor unit controller

The indoor unit controller judges the operation commands from the remote controller and assumes the following functions.

- Judgment of suction air temperature of the indoor heat exchanger by using the indoor temp. sensor.
- Temperature setting of the indoor heat exchanger by using heat exchanger sensor (Prevent-freezing control)
- Louver motor control
- Indoor fan motor operation control
- LED display control
- Transferring of operation command signal (Serial signal) to the outdoor unit
- Reception of information of operation status (Serial signal including outside temp. data) to the outdoor unit and judgment/display of error

(2) Role of outdoor unit controller

Receiving the operation command signal (Serial signal) from the indoor controller, the outdoor unit performs its role.

- Compressor operation control
- Operationcontrol of outdoor fan motor
- P.M.V. control

} Operations followed to judgment of serial signal from indoor side.

- Detection of inverter input current and current release operation
- Over-current detection and prevention operation to transistor module (Compressor stop function)
- Compressor and outdoor fan stop function when serial signal is off (when the serial signal does not reach the board assembly of outdoor control by trouble of the signal system)
- Transferring of operation information (Serial signal) from outdoor unit to indoor unit
- Detection of outdoor temperature and operation revolution control
- Defrost control in heating operation (Temp. measurement by outdoor heat exchanger and control for 4-way valve and outdoor fan)

(3) Contents of operation command signal (Serial signal) from indoor unit controller to outdoor unit controller

The following three types of signals are sent from the indoor unit controller.

- Operation mode set on the remote controller
- Compressor revolution command signal defined by indoor temperature and set temperature
  (Correction along with variation of room temperature and correction of indoor heat exchanger temperature are added.)
- For these two types of signals ([Operation mode] and [Compressor revolution]), the outdoor unit controller monitors the input current to the inverter, and performs the followed operation within the range that current does not exceed the allowable value.
- Temperature of indoor heat exchanger by indoor heat exchanger sensor
  (Minimum revolution control)

(4) Contents of operation command signal (Serial signal) from outdoor unit controller to indoor unit controller

The following signals are sent from the outdoor unit controller.

- The current operation mode
- The current compressor revolution
- Outdoor temperature
- Existence of protective circuit operation

For transferring of these signals, the indoor unit controller monitors the contents of signals, and judges existence of trouble occurrence.

Contents of judgment are described below.

- Whether distinction of the current operation status meets to the operation command signal
- Whether protective circuit operates

When no signal is received from the outdoor unit controller, it is assumed as a trouble.

6-1-1. Capacity Control

The cooling capacity is varied by changing compressor motor speed. The inverter changes compressor motor speed by changing AC 220–240V power to DC once, and controls capacity by changing supply power status to the compressor with transis-tor module (includes 6 transistors). The outline of the control is as follows : The revolution position and revolution speed of the motor are detected by detecting winding electromotive force of the com pressor motor under operation, and the revolution speed is changed so that the motor drives based upon revolution speed of the operation command by changing timing (current transfer timing) to ex change inverter output voltage and supply power winding.

Detection of the revolution position for controlling is performed 12 times per 1 revolution of compressor.

The range of supply power frequency to the com pressor differs according to the operation status (COOL, DRY).

Table 6-1-1 Compressor revolution range

Operation mode	No. of operating unit	Combination of indoor units	Compressor revolution (rps)	Operation mode	No. of operating unit	Combination of indoor units	Compressor revolution (rps)
COOL	1 unit	M10	20 to 28	HEAT	1 unit	M10	15 to 52
		M13	20 to 43			M13	15 to 63
		M16	20 to 53			M16	15 to 67
	2 units	*	20 to 66		2 units	*	15 to 90
	3 units	*	31 to 69		3 units	*	17 to 90
	4 units	*	31 to 69		4 units	*	22 to 90

* In case that any multiple indoor units are combined.

6-1-2. Current Release Control

The outdoor main circuit control section (Inverter assembly) detects the input current to the outdoor unit. If the current value with compressor motor speed instructed from indoor side exceeds the specified value, the outdoor main circuit control section controls compressor motor speed by reducing motor speed so that value becomes closest to the command within the limited value.

6-1-3. Power Factor Improvement Control

Power factor improvement control is performed mainly aiming to reduce the current on much power consumption of cooling/heating operation. Controlling starts from the time when input power has reached at a certain point. To be concrete, IGBT of the power factor improvement circuit is used, and the power factor is improved by keeping IGBT on for an arbitrary period to widen electro-angle of the input current.

6-1-4. Prevent-Freezing Control

The indoor heat exchanger sensor detects refrigerant vapor temperature in COOL/DRY operation. If the temperature is below the specified value, compressor motor speed is reduced so that operation is performed in temperature below the specified value to prevent-freezing of indoor heat exchanger.

6-1-5. P. M. V. (Pulse Modulating Valve)

Using P.M.V., refrigerant flow of refrigeration cycle is varied for the optimum temperature. Controlling each unit separately by four P.M.V. corresponds to difference of pipe length, fan speed, and unit temperature.

If an error occurs on cycle temperature when power source of the air conditioner has been turned on, and if start/stop times of the outdoor unit are 30 times, move the valve once until it hits on the stopper for positioning of the valve. In this case, ticktack sound may be heard.

6-1-6. Louver Control

(1) Vertical air flow louvers

Positions of vertical air flow louvers are automatically controlled according to the operation status (AUTO, COOL, DRY, HEAT). Besides, positions of vertical air flow louvers can be arbitrarily set by pressing the [FIX] button. The louver position which has been set by the [FIX] button is stored in microcomputer, and the louver is automatically set at the stored position in the next operation.

(2) Swing

If the [SWING] button is pressed during running operation, vertical air flow louvers start swinging. When the [SWING] button is pressed again, swinging stops.

6-1-7. Indoor Fan Control

The indoor fan is operated by motor speed non-step variable drive system motor. For flow rate, motor speed is controlled manually in five steps and with the unit of 10 rpm from upper limit to lower limit in AUTO mode as described in Table 6-1-2. It is not selected by relay, so selecting sound does not generate.

Table 6-1-2

operation mode	Fan mode		M10		M13		M16	
		Remote Control	Motor speed (rpm)	Air flow rate (m^3/h)	Motor speed (rpm)	Air flow rate (m^3/h)	Motor speed (rpm)	Air flow rate (m^3/h)
Cooling and Fan only	H	HIGH	1190	570	1210	590	1350	650
	M+		1120	530	1130	530	1250	610
		MED+	1120	530	1130	530	1250	610
	M	MED	1050	490	1050	490	1150	550
		LOW+	980	440	980	440	1070	500
	L+		930	420	930	420	1000	460
	L	LOW	910	410	910	410	980	440
	L-		850	370	850	370	920	410
DRY	L+		930	420	930	420	1000	460
	L		910	410	910	410	980	440
	L-		850	370	850	370	920	410
	UL		720	290	750	310	920	410
	SUL		660	260	700	280	800	340
Heating	H	HIGH	1250	610	1290	620	1370	660
	M+		1200	570	1280	620	1360	660
		MED+	1160	550	1200	570	1280	620
	M	MED	1060	490	1100	520	1180	560
		LOW+	1000	460	1020	470	1100	520
	L+		1050	490	1050	490	1150	550
	L	LOW	940	420	940	420	1020	470
	L-		930	420	930	420	1000	460

NOTE :

- UL : Ultra Low, SUL : Super Ultra Low

6-1-7. Outdoor Fan Control (DC Fan Motor)

Although the outdoor fan motor drives the outdoor fan by non-step variable system of the revolution speed, the revolution speed is restricted to three steps on the convenience of controlling.

If a strong wind is lashing outside of the room, the operation may be continued as the outdoor fan stops in order to protect the outdoor fan motor.

If a fan lock occurred due to entering of foreign matter, the air conditioner stops and an alarm is displayed.

<COOL, DRY>

Table 6-1-3

Compressor revolution (rps)			20.3	~ 50.3	~ 62.8	63.4 ~
Outdoor temp. sensor TO	TO ≥ 38°C		390 (rpm)	700 (rpm)	700 (rpm)	700 (rpm)
	TO < 38°C	1 to 2 units	390 (rpm)	640 (rpm)	640 (rpm)	700 (rpm)
		3 to 4 units	390 (rpm)	500 (rpm)	640 (rpm)	700 (rpm)
ECONO. operation	TO ≥ 38°C		390 (rpm)	640 (rpm)	640 (rpm)	640 (rpm)
	TO < 38°C		390 (rpm)	500 (rpm)	500 (rpm)	500 (rpm)
TO is abnormal			500 (rpm)	640 (rpm)	640 (rpm)	640 (rpm)

<HEAT>

Table 6-1-4

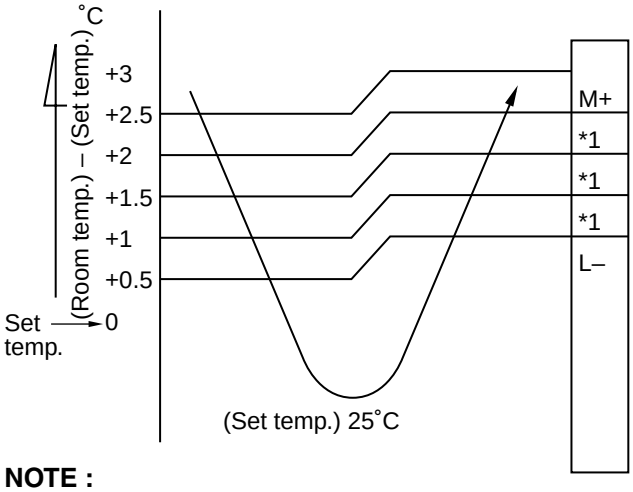
Compressor revolution (rps)		20.3	~ 33.3	~ 33.9
Outdoor temp. sensor TO	TO ≥ 5°C	390 (rpm)	640 (rpm)	640 (rpm)
	TO < 5°C	500 (rpm)	640 (rpm)	640 (rpm)
ECONO. operation	TO ≥ 5°C	390 (rpm)	500 (rpm)	500 (rpm)
	TO < 5°C	390 (rpm)	500 (rpm)	500 (rpm)
TO is abnormal		390 (rpm)	500 (rpm)	640 (rpm)

6-2. Description of Operation Circuit

- Turning [ON] the breaker flashes the operation lamp.
  This is the display of power-ON (or notification of power failure).
- When pushing [⏻] button of the remote controller, receive sound is issued from the main unit, and the next operations are performed together with opening the vertical air flow louvers.

6-2-1. Fan Only Operation (The Remote controller [MODE] Button is Set to the FAN ONLY Operation)

- This mode is only for the cooling only model.
- Once the setting is made, the operation mode is memorized in the microcomputer so that the same operation can be effected thereafter simply by pushing [⏻] button.
- When the [FAN] button is set to the AUTO position, the indoor fan motor operates as shown in Fig. 6-2-1. When the [FAN] button is set to LOW, LOW$^+$ MED, MED$^+$, or HIGH, the motor operates with a constant air flow.
- ECONO, Hi POWER and COMFORT SLEEP mode cannot be set.



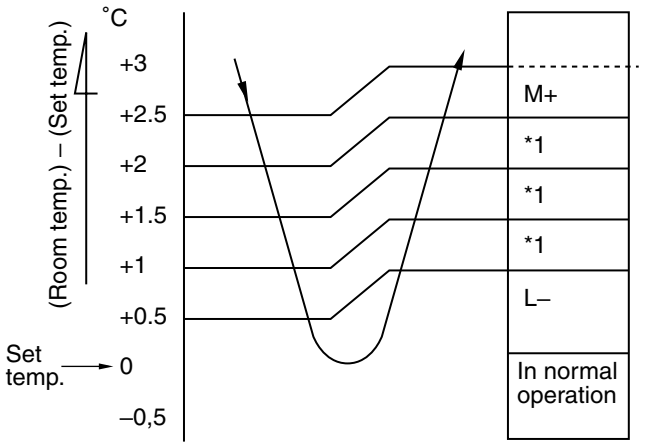
NOTE :

*1: Calculated from difference in motor speed of M+ and L–, and controlled.

Fig. 6-2-1 Auto setting of air flow

6-2-2. Cooling Operation (The Remote controller [MODE] Button is Set to the COOL Position)

- Once the setting is made, the operation mode is memorized in the microcomputer so that the same operation can be effected thereafter simply by pushing [⏻] button.
- A cooling operation signal is transmitted to outdoor unit.
- The indoor fan motor operates as shown in Fig.6-2-2 when [FAN] button is set to AUTO.
- The motor operates with a constant air flow when the [FAN] button is set to LOW, LOW$^+$, MED, MED$^+$, or HIGH.
- The outdoor unit controls the outdoor fan relay R01, R02 and R03, and the compressor motor speed according to the operation command signal sent from the indoor unit.



NOTE :

*1: Calculated from difference in motor speed of M+ and L–, and controlled.

Fig. 6-2-2 Setting of air flow [Air Flow AUTO]

(1) Cooling capacity control

- The cooling capacity and room temperature are controlled by changing the compressor motor speed according to both the difference between the temperature detected by the room temperature sensor and the temperature set by [TEMP] button and also any change in room temperature.
- When compressor has been activated or reactivated, it operates with Max. 33 rps for 2 minutes and with Max. 57 rps from 2 to 4 minutes passed.
- When room temperature is lower than set temperature and indoor fan motor is operated at fan speed L– as shown in Fig. 6-2-2 while the outdoor unit stops.

(2) Prevent-freezing control

If temperature of indoor heat exchanger detected by the indoor heat exchanger sensor is 5°C or lower, compressor motor speed is gradually lowered to prevent freezing of the indoor heat exchanger. If temperature is 7°C or higher, return the operation to the above item (1).

(3) Current release control

The input current of compressor and outdoor fan motor (Precisely inverter main circuit control section) which occupy most of air conditioner input is detected by the outdoor current sensor, and compressor motor speed is gradually lowered so that current value does not exceed 11.5A if current value exceeds 11.5A. When the current value lowers to 11.0A, return the operation to the above item (1).

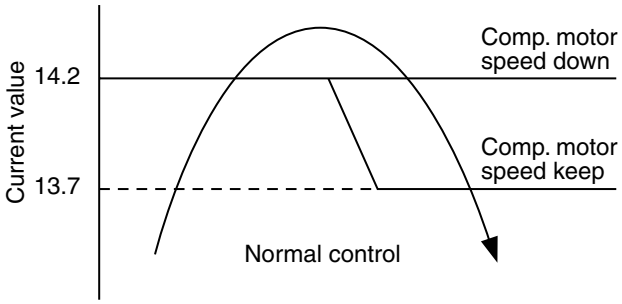


Fig. 6-2-3

(4) Outdoor temperature release control

The outdoor temperature release is controlled by changing the current release points 14.2 and 13.7 in the above item according to temperature detected by the outdoor temperature sensor.

For example, if the outdoor temperature is 43°C, the value of current release points becomes 9.6A.

(5) Limit for maximum compressor motor speed by indoor fan speed

When outdoor temperature sensor detected 32°C or lower, and indoor heat exchanger sensor detected 17°C or lower, the maximum compressor motor speed is limited by the indoor fan speed.

For example, when 1 unit only operates, the compressor motor speed is limited as described in the table below.

Table 6-2-1

Air flow rate	M10 (rps)	M13 (rps)	M16 (rps)
HIGH	32	48	54
M+	29	42	46
MED	24	28	38
L	20	20	30
L–	20	20	30
UL	20	20	20
SUL	20	20	20

(6) Louver control

The vertical air flow louvers are automatically set to horizontal or cool memory position.

When temperature of indoor heat exchanger becomes 5°C or lower by the prevent-freezing control and the compressor is turned off, the vertical air flow louvers close once and then return to the position of previous time.

(7) Discharge temperature control

The discharge temperature of refrigerant gas from the compressor is detected by the discharge temperature sensor, and controls operating compressor motor speed.

1) Control 1 (A zone) : Normal operation zone

   When TD detect value is 101°C or lower, the operation is performed with operating motor speed instructed by the serial signal.

2) Control 2 (B zone) : Slow-up zone of motor speed

   When TD detect value is 101°C or higher, operating motor speed is slowly up.

3) Control 3 (C zone) : Keep zone

   When TD detect value is 108°C or higher, operating motor speed is not changed if raising operation speed.

4) Control 4 (D zone) : Slow down zone of motor speed

   When TD detect value is 111°C or higher, operating motor speed is slowly down.

5) Control 5 (E zone) : Normal down of motor speed

   When TD detect value is 115°C or higher, operating motor speed is down.

6) Control 6 (F zone) : Operation stop zone

   If TD detect value exceeds 120°C during operation, stop the operation immediately.

   Then, restart the operation when TD detect value becomes 108°C or lower.

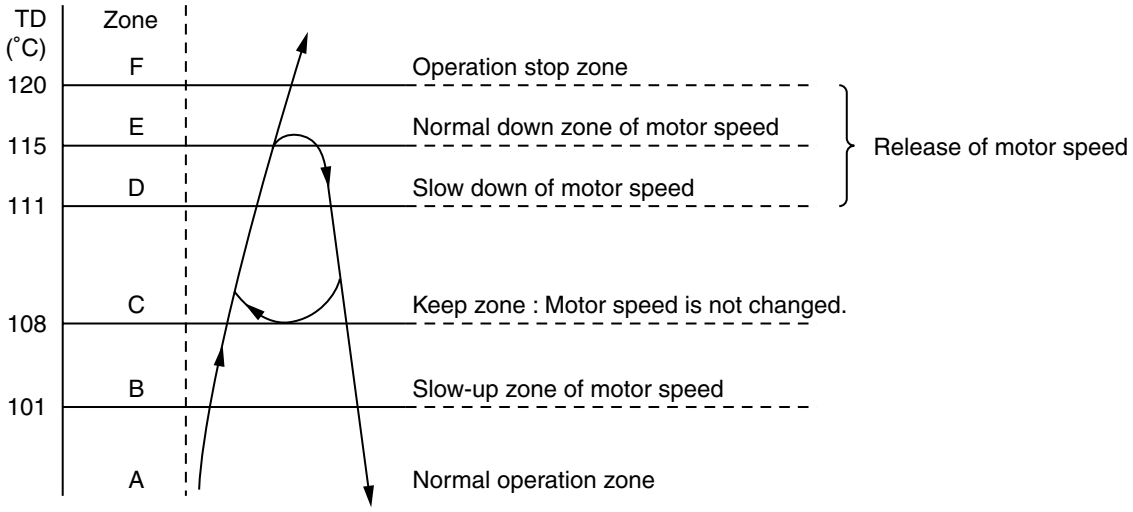
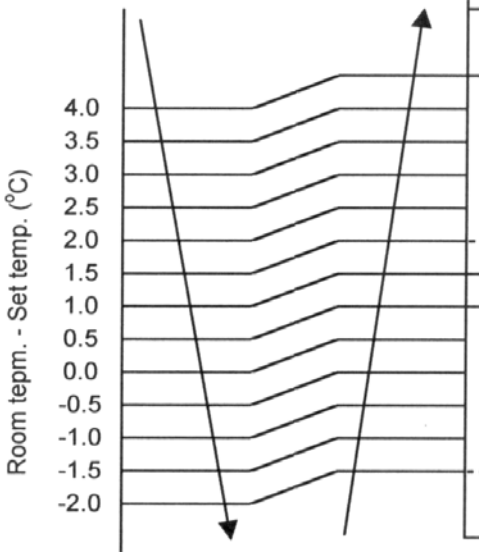


Fig. 6-2-4 Compressor motor speed control

(8) ECONO operation control

When the [ECO] button is pushed, ECONO operation is performed by restraining air flow and compressor motor speed. The set temperature is changed also.

1) The set temperature increased 0.5°C per hour up to 2°C starting from the set temperature when ECONO has been received.
2) Indoor air flow is controlled between L^+ and UL. The compressor motor speed in control as shown in Fig. 6-2-5



Indoor Fan	Compressor motor speed				
	1 Unit operation			Same time operation	
	M10	M13	M16	3MYA..	4MYA..
L+	20 rps	20 rps	20 rps	52 rps	52 rps
L	20 rps	20 rps	20 rps	31-52 rps	31-52 rps
L-	20 rps	20 rps	20 rps	31 rps	31 rps
UL					
OFF					

Fig. 6-2-5

(9) COMFORT SLEET operation control.

When the [COMFORT SLEEP] button is pushed, the ECONO operation activate together with the timer OFF function. Each time of pressing [COMFORT SLEEP] button the off timer setting changes in the sequence of 1, 3, 5 or 9 hours.

(10) Hi POWER operation control.

When the [Hi POWER] button is pushed Hi Power operation is performed by change set temperature and air flow (display on the remote control does not change).

1) Changing of set temperature.

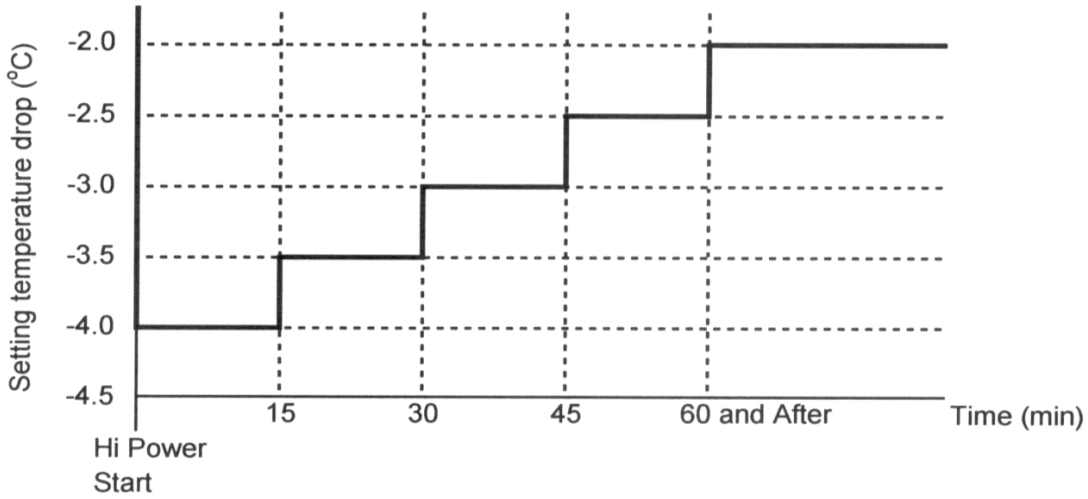


Fig. 6-2-6

2) Changing of air flow (Fan setting : AUTO)
When the Hi POWER is started, the fan of the indoor unit operates at higher air flow level than normal air flow AUTO (normal air flow AUTO is shown in Fig. 6-2-2). Because of the difference between room temperature and set temperature are increased automatically.

3) Changing of air flow (Fan setting : One of 5 levels)
When the Hi POWER is started, the fan of the indoor unit operates at higher consecutive air flow level. (Fan speed on the display of remote control does not change)

4) Changing of louver position
If the room temperature is higher than setting temperature by 3.5 °C or more, the louver is automatically set to the maximum air flow position. If it is not, position of louver is not change. When room temperature is reach to setting temperature. The louver moves back to set position.

(11) Quiet operation control.

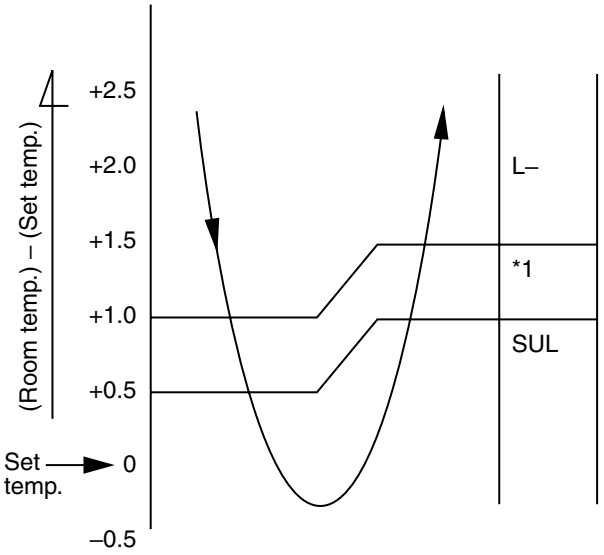
When the [QUIET] button is pushed, the fan is restricted the revolution speed at L- level until the [QUIET] button is pushed once again (cancel QUIET operation).

Remarks :

QUIET operation is appropriate to work with less cooling load condition. Because of the fan speed L- may cause not enough the cooling capacity.

6-2-3. DRY Operation (The Remote controller [MODE] Button is Set to the DRY Position)

- Once the setting is made, the operation mode is memorized in the microcomputer so that the same operation can be effected thereafter simply by pushing [⏻] button.
- Dry operation signal is transmitted to outdoor unit.
- The Cooling operation giving priority to dehumidifying, which restrains the indoor fan speed and compressor motor speed, is performed.
- The indoor fan motor operates as shown in Fig. 6-2-7. (Fan speed is AUTO only.)
- The outdoor unit controls the outdoor fan relay R01, R02 and R03, and the compressor motor speed according to the operation command signal sent from the indoor unit.



NOTE :

*1 : Middle motor speed between L– and SUL

Fig. 6-2-7 Setting of air flow

(1) Dehumidifying-preferential Cooling capacity control

- The cooling capacity and room temperature are controlled by changing the compressor motor speed according to both the difference between the temperature detected by the room temperature sensor and the temperature set by [TEMP] button and also any change in room temperature.
- When the air conditioner operates in Dry mode, the maximum compressor motor speed is restricted.

  M10 : Max. 20 rps
  M13 : Max. 20 rps
  M16 : Max. 22 rps

  While multiple indoor units operate, compressor motor speed is calculated in the outdoor unit to operate.
- When room temperature is lower than set temperature, indoor fan motor is operated at fan speed SUL as shown in Fig. 6-2-6 while the outdoor unit stops.
- ECONO Hi POWER, QUIET and COMFORT-SLEEP mode cannot be set.
- Other controls than the above-mentioned controls are common to those of cooling operation.

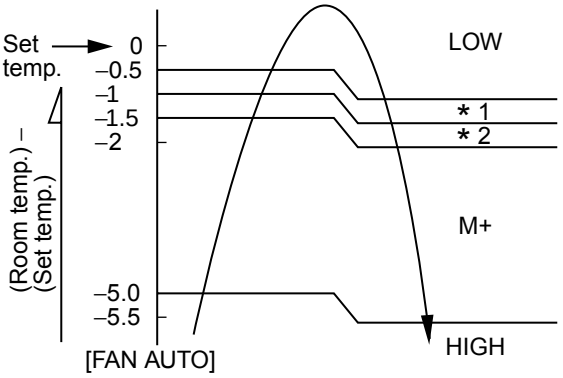
6-2-4. Heating Operation

Transferring of heating operation signal from indoor unit to outdoor unit starts.

The indoor fan motor operates by the room temperature when selecting "AUTO" of "FAN" as shown in Fig. 6-2-8, and operates with a set air flow when selecting LOW to HIGH.

However, to prevent cold draft, revolution speed of the fan is restricted by indoor heat exchanger when air flow is AUTO (Fig. 6-2-9) and starting of FAN Manual.

[Basic control]



*1, *2 : Approximate revolution speed of M+ and L to linear according to temperature.

Fig. 6-2-8 Setting of air flow

[Cold draft preventing control]

The upper limit of fan revolution speed is shown below.

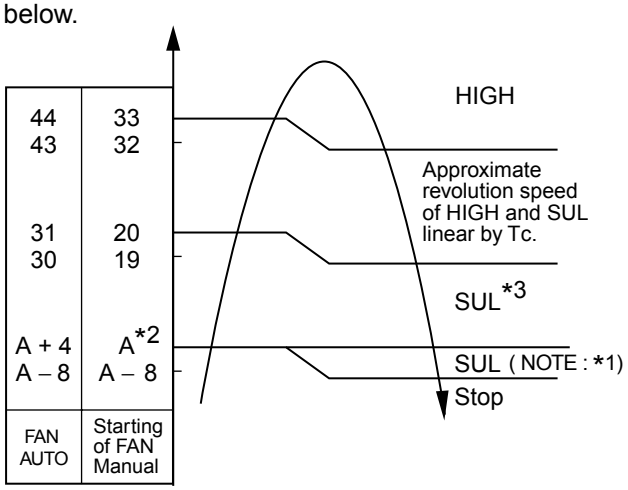


Fig. 6-2-9 Cold draft preventing control

NOTES :

(1) Stops for 2 minutes after thermostat-OFF.

(2) 24°C when the set temp. is 24°C or more
Set temp. when the set temp. is below 24°C

(3) SUL : Super ultra low

[In star ting and in stability]

	In star ting	In stability
FAN AUTO	• Until 12 minutes passed after operation start • When 12 to 25 minutes passed after operation start and room temp. is 3°C or lower than set temp.	• When 12 to 25 minutes passed after operation start and room temp. is higher than (set temp. –3°C) • When 25 minutes or more passed after operation start
FAN Manual	• Room temp.≥□ Set temp. –4°C	• Room temp. > Set temp. –3,5°C

The outdoor unit controls the outdoor fan based upon the operation signal sent from the indoor unit, and also controls revolution speed of the compressor motor.

The power coupler (IC20) for four-way valve is turned on, and turned off in defrost operation.

(1) Heating capacity control

Calculate the difference between temperature detected by room temp. sensor every minute and the set temp. set on "Temp. indicator" and variation amount of room temp.

Then, obtain the correction amount of the command signal, and correct the current frequency command signal.

(2) High-temp. release control

If temperature of the indoor heat exchanger detected by the indoor heat exchanger sensor is 55°C or higher, compressor motor speed is gradually lowered to prevent over-temp. rising of compressed pressure.

If temperature becomes below 48°C, return to above item (1).

(3) Current release control

The input current of compressor and outdoor fan motor (Precisely inverter main circuit control section) which occupy most of air conditioner input is detected by the outdoor current sensor. The compressor motor speed is lowered gradually according to the range of TO (outside air temp.) if the input current exceeds the current value determined in each zone as shown in Fig. 6-2-10 so that the input current does not exceed the set value.

In case that the current lowered by approx. 0.3A to 0.5A than each set value, return to above item (1).

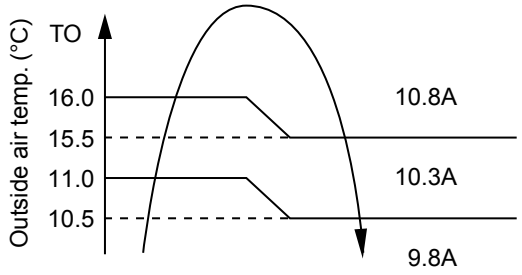


Fig. 6-2-10

(4) Defrost control

1) Detection of frost

In heating operation, time duration while the compressor operates is counted, and defrost operation starts by any condition described below.

a. The counted time is 28 minutes or more, and status that temperature of the outdoor heat exchanger detected by the outdoor heat exchanger is −20°C or lower continued for 3 minutes or more.

b. The counted time is 28 minutes or more, and status that temperature of the outdoor heat exchanger detected by the outdoor heat exchanger is −8°C or lower and temperature lowered by 2.5 °C than the minimum value of the outdoor heat exchanger during 10 to 15-minutes count time continued for 3 minutes or more.

c. The counted time is 34 minutes or more, and status that temperature of the outdoor heat exchanger detected by the outdoor heat exchanger is −5°C or lower and temperature lowered by 3.0 °C than the minimum value of the outdoor heat exchanger during 10 to 15 minutes count time continued for 3 minutes or more.

d. The counted time is 4 hours or more, and status that temperature of the outdoor heat exchanger detected by the outdoor heat exchanger is 0°C or lower and temperature lowered by 1.0 °C than the minimum value of the outdoor heat exchanger during 10 to 15 minutes count time continued for 3 minutes or more.

e. If the following three conditions are satisfied, defrost operation (Timer defrost) starts after heating operation for 48 minutes.

① Setting on remote control, HEAT (mode), HIGH (Fan), 30°C (temp.).

② Room temp. is 19°C to 24°C, and outside air temp. is 5°C or lower.

③ Defrost operation has been already performed once.

2) Defrost operation

Operation of the compressor is stopped once, turn off power coupler for four-way valve after 10 seconds, and then exchange the four-way valve.

After 20 seconds, restart operation of the compressor. Turn off the outdoor fan just when the compressor stopped.

If temperature of the indoor heat exchanger lowered than 38°C, stop the indoor fan.

3) Defrost reset

Resetting operation from defrost to heating is performed when any one of the following conditions is satisfied.

a. Temperature of the outdoor heat exchanger rose to +8°C or higher.

b. A status that temperature of the outdoor heat exchanger is +5°C or higher continued for 80 seconds.

c. Defrost operation continued for 10 minutes.

In resetting defrost operation, the compressor stops for 50 seconds if defrost has started under condition a. to d. in item 1), but the compressor is reset to heating operation keeping operated if defrost has started under condition e. in item 1).

(5) Louver control

The vertical air flow louvers are automatically set to heating position or heat memory position.

When the compressor is turned off by high-temp. release control, the vertical air flow louvers close once and then return to the position of previous time.

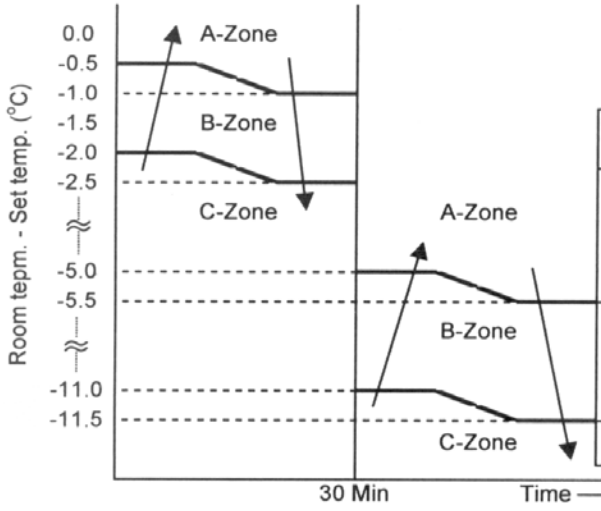
(6) ECONO operation control.

When the [ECO] button is pushed, ECONO operation is performed by restraining air flow and compressor moter speed.

1) The indoor fan speed is controlled within L-as maximum speed.

2) Compressor motor speed is controlled by the difference value of room temperature and set temperature as shown in Fig. 6-2-11
The different value of room temperature and set temperature are separated to A, B and C zone. Then compressor motor speed in each zone are controlled by different speed.

After 30 minutes passed, the different value of room temperature and set temperature is separated zone again by more different value than before. Then compressor motor speed after 30 minute passed is lower than before by the same different value of room temperature and set temperature.



Zone	1 Unit operation			Same time operation	
	M10	M13	M16	3MYA..	4MYA..
A	15 rps	15 rps	15 rps	17 rps	22 rps
B	15-36 rps	15-36 rps	15-36 rps	17-41 rps	17-41 rps
C	36 rps	36 rps	36 rps	41 rps	41 rps

Fig. 6-2-11

(7) COMFORT SLEEP operation control.

When the [COMFORT SLEEP] button is pushed, the ECONO operation actrvate together with the timer OFF function. Each time of pressing [COMFORT SLEEP] button the off timer setting changes in the sequence of 1, 3, 5 or 9 hours.

(8) Hi POWER operation control.

When the [Hi POWER] button is pushed Hi Power operation is performed by changing setting temperature and air flow (display on the remote control does not change).

1) Changing of setting temperature.

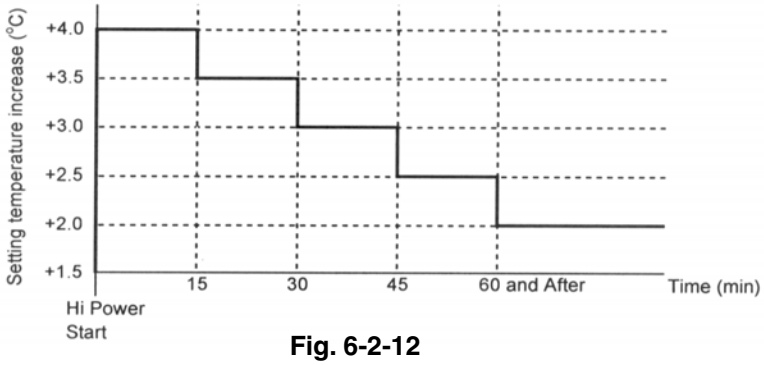


Fig. 6-2-12

2) Changing of air flow (Fan setting : AUTO)
When the Hi POWER is started, the fan of the indoor unit operates at higher air flow level than normal air flow AUTO (normal air flow AUTO is shown in Fig. 6-2-8). Because of the difference between room temperature and setting temperature are increased automatically.

3) Changing of air flow (Fan setting : One of 5 levels)
When the Hi POWER is started, the fan of the indoor unit operates at higher consecutive air flow level. (Fan speed on the display of remote control does not change)

(9) QUIET operation control.

When the [QUIET] button is pushed, the fan is restricted the revolution speed at L- level until the [QUIET] button is pushed once again (cancel QUIET operation).

Remarks :
QUIET operation is appropriate to work with less heating load condition. Because of the fan speed L- may cause not enough the heating capacity.

6-2-5. Auto Operation

(1) As shown in Fig. 6-2-13, the operation mode (COOL, DRY, HEAT) is selected according to the outside temperature when the operation has started.

The operation in Fan mode continues until an operation mode is selected.

If the room temperature is 20°C or higher when "AUTO" operation started within 2 hours after "HEAT" operation had stopped. select an operation mode after Fan operation of ultra low fan.

In AUTO operation, the set temperature of each operation can be corrected by the remote controller in the range of Ts = ± 5°C.

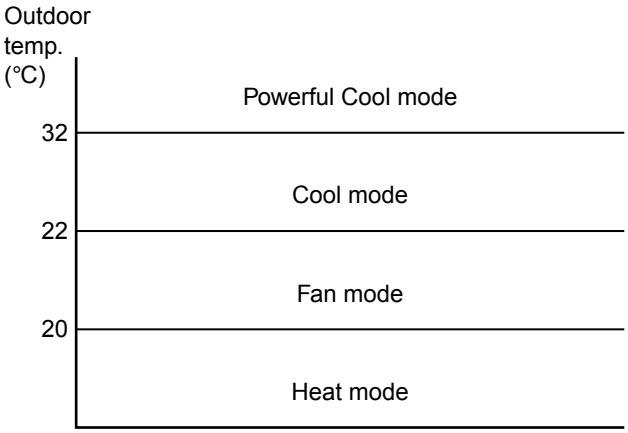


Fig. 6-2-13

(2) After selecting the operation mode (COOL, DRY, HEAT), select an operation mode again when a status that the compressor was turned off by the room temperature or outside air temperature continues for 15 minutes.

(3) After selecting DRY operation, a status that the room temperature is the set temp. −2°C continues for 15 minutes, select an operation mode again.

(4) Powerful Cool mode control

When the outside temperature is above 32°C and indoor temperature is above 28°C, select Cool mode control. In Cool mode, the air flow louver directs downward. When the room temperature gains access to the set temperature, it becomes cool memory position.

6-3. Temporary Operation

- Temporary Auto operation, existence of Auto Restart, and Temporary Cooling operation can be set by the [RESET] button of the indoor controller.

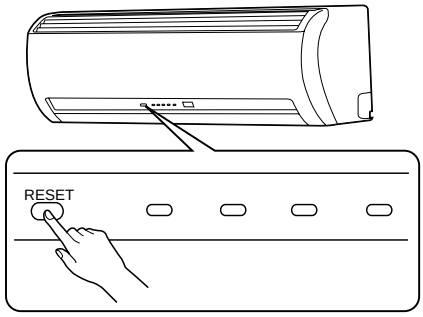


Fig. 6-3-1

[RESET] button	Control
OFF→ON	Temporary Auto operation start
After pushing button for 3 seconds	Auto Restart control select
After pushing button for 10 seconds	Temporary Cooling operation start

6-3-1. Temporary Auto Operation

- When the [RESET] button is pushed, the Auto operation with set temperature fixed at 24°C starts. Controlling is same as that of Auto operation by the remote controller.
- When the [RESET] button is pushed again, the operation stops.
- During Temporary Auto operation, operation by the remote controller is accepted.
- Using the Auto Restart function, the Temporary Auto operation starts when power failure is reset.

6-3-2. Temporary Cooling Operation

- When the [RESET] button keeps pushed for 10 seconds, Cooling operation of which compressor motor speed and the indoor fan speed are fixed starts.

  Compressor motor speed : 24.5 rps

  Indoor fan speed : Low
- When the [RESET] button is pushed again, the operation stops.
- Auto Restart function is unavailable.

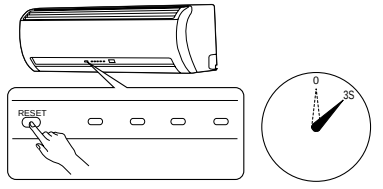
6-4. Auto Restart Function

The indoor unit is equipped with an automatic restarting function which allows the unit to restart operating with the set operating conditions in the event of power supply being accidentally shut down. The operation will resume without warning three minutes after power is restored.
This function is not set to work when shipped from the factory. Therefore it is necessary to set it to work.

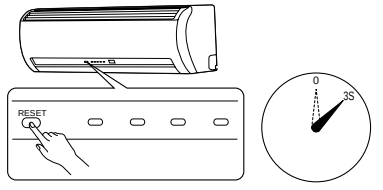
6-4-1. How to set auto restart function

To set the auto restart function, proceed as follows:
The power supply to the unit must be on; the function will not set if the power is off.
Push the [RESET] button located in the center of the front panel continuously for three seconds.
The unit receives the signal and beeps three times.
The unit then restarts operating automatically in the event of power supply being accidentally shut down.

When the unit is on standby (Not operating)

Operation	Motions
Push [RESET] button for more than three seconds. 	The unit is on standby. ↓ The unit starts to operate. The green lamp is on. ↓ After approx. three seconds, The unit beeps three times and continues to operate. The lamp changes from green to orange. If the unit is not required to operate at this time, push [RESET] button once more or use the remote control to turn it off.

When the unit is in operation

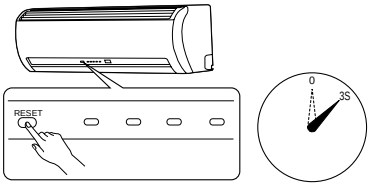
Operation	Motions
Push [RESET] button for more than three seconds. 	The unit is in operation. The green lamp is on. ↓ The unit stops operating. The green lamp is turned off. ↓ After approx. three seconds, The unit beeps three times If the unit is required to operate at this time, push [RESET] button once more or use the remote control to turn it on.

- While this function is being set, if the unit is in operation, the orange lamp is on.
- This function can not be set if the timer operation has been selected.
- When the unit is turned on by this function, the louver will not swing even though it was swinging automatically before shutting down.
- While the filter check lamp is on, the [RESET] button has the function of filter reset button.

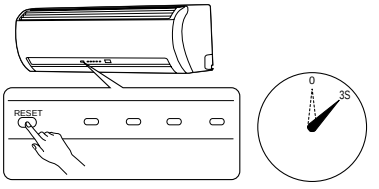
6-4-2. How to cancel auto restart function

To cancel auto restart function, proceed as follows:
Repeat the setting prodedure: the unit receives the signal and beeps three times.
The unit will be required to be turned on with the remote control after the main power supply is turned off.

When the unit is on standby (Not operating)

Operation	Motions
Push [RESET] button for more than three seconds. 	The unit is on standby. ↓ The unit starts to operate. The orange lamp is on. ↓ After approx. three seconds, The unit beeps three times and continues to operate. The lamp changes from orange to green. If the unit is not required to operate at this time, push [RESET] button once more or use the remote control to turn it off.

When the unit is in operation

Operation	Motions
Push [RESET] button for more than three seconds. 	The unit is in operation. The orange lamp is on. ↓ The unit stops operating. The orange lamp is turned off. ↓ After approx. three seconds, The unit beeps three times If the unit is required to operate at this time, push [RESET] button once more or use the remote control to turn it on.

- While this function is being set, if the unit is in operation, the orange lamp is on.

6-4-3. Power failure during timer operation

When the unit is in Timer operation, if it is turned off because of power failure, the timer operation is cancelled. Therefore, set the timer operation again.

6-5. Filter Check Lamp

When the elapsed time reaches 1000 hours, the filter check lamp indicates. After cleaning the filters, turn off the filter check lamp.

6-5-1. How to turn off filter check lamp

Push [RESET] button on the indoor unit.

Note:
If [RESET] button is pushed while the filter check lamp is not indicating, the indoor unit will start the Automatic Operation.

6-6. Remote control

6-6-1. Remote control and its functions

RAS-M10UKCV, RAS-M13UKCV, RAS-M16UKCV

① **Infrared signal emitter**
Transmits a signal to the indoor unit.

② **START/STOP button** [⏻]
Push the button to start operation.
(A receiving beep is heard.)
Push the button again to stop operation.
(A receiving beep is heard.)
If no receiving sound is heard from the indoor unit, push the button twice.

③ **Mode select button [MODE]**
Push this button to select a mode.
Each time you push the button, a mode is selected in a sequence that goes from A : Auto changeover control, ☼ : Cool, 💧 : Dry, ☼ : Heat, ✿ : Fan only, and back to A.
(A receiving beep is heard.)

④ **Temperature button [TEMP.]**
▲.....The set temperature is increased up to 30°C.
▼.....The set temperature is dropped down to 17°C.
(A receiving beep is heard.)

⑤ **Fan speed button [FAN]**
Push this button to select fan speed. When you select AUTO, the fan speed is automatically adjusted according to the room temperature.
You can also manually select the desired fan speed from among five settings.
(LOW ▂ , LOW+ ▂▃ , MED ▂▃▅ , MED+ ▂▃▅▆ , HIGH ▂▃▅▆▇)
(A receiving beep is heard.)

⑥ **Auto louver button [SWING]**
Push this button to swing the louver.
(A receiving beep is heard.)
Push the button again to stop the louver swinging.
(A receiving beep is heard.)

⑦ **Set louver button [FIX]**
Push this button to adjust the air flow direction.
(A receiving beep is heard.)

⑧ **On timer button [ON]**
Push this button to set the ON timer.

⑨ **Off timer button [OFF]**
Push this button to set the OFF timer.

⑩ **Reserve button [SET]**
Push this button to reserve setting of time, ON timer or OFF timer. (A receiving beep is heard.)

⑪ **Cancel button [CLR]**
Push this button to cancel ON timer and OFF timer. (A receiving beep is heard.)

⑫ **Sleep timer button [SLEEP]**
Push this button to set the OFF timer.
(1, 3, 5 or 9 hours) (A receiving beep is heard)

⑬ **High power button [Hi POWER]**
Push this button to start the high power operation. (A receiving beep is heard.)

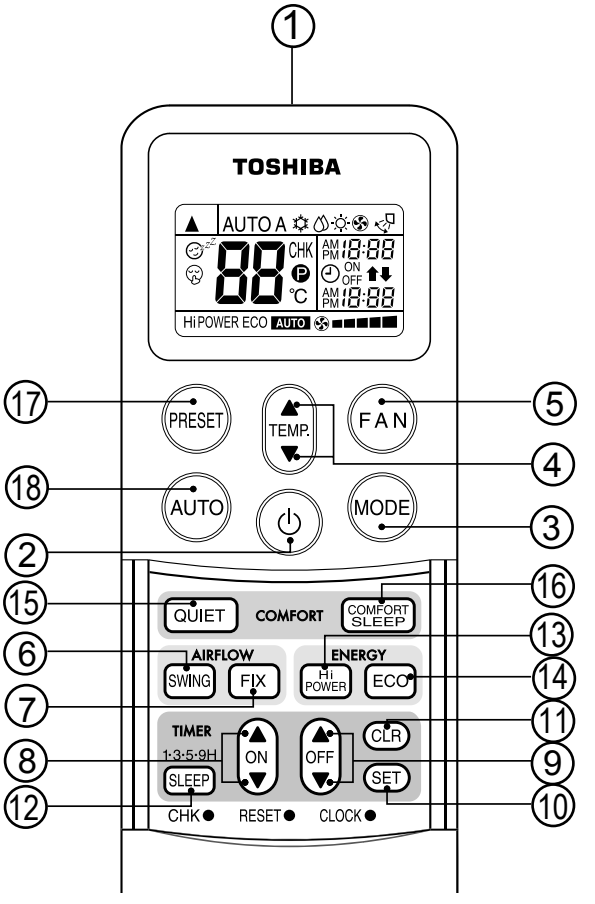
⑭ **ECO timer button [ECO]**
Push this button to start the ECO operation.
(A receiving been is heard)

⑮ **Quiet button [QUIET]**
Push this button to start the quiet operation.
(A receiving been is heard)

⑯ **Comfort sleep button [COMFORT SLEET]**
Push this button to start the comfort sleep operation. OFF timer neccessary to set together (1, 3, 5 or 9 hours). (A receiving been is heard)

⑰ **PRESET button**
Push this button to operate the air conditioner according to settings memorized. (A receiving been is heard)
Or push the button for more than 4 seconds to memorize the setting indicated on the remote control and Ⓟ mark is indicated.

⑱ **Automatic operation button [AUTO]**
Push this button to operate the air conditioner automatically.
(A receiving beep is heard.)



6-6-2. Names and functions of indications on remote control

Display
All indications, except for clock time indication, are indicated by push the [⏻] button.

① **Transmission mark**
This transmission mark (▲) indicates when the remote control transmits signals to the indoor unit.

② **Mode display**
Indicates the current operation mode.
(AUTO : Automatic control, A : Auto changeover control, ☼ : Cool, 💧 : Dry, ☀ : Heat, 🌀 : Fan only)

③ **Temperature display**
Indicates the temperature setting (17°C to 30°C).
When you set the operating mode to 🌀 : Fan only, no temperature setting is indicated.

④ **Louver operation display**
Indicates the louver operation. (: Fix, : Swing).

⑤ **FAN speed display**
Indicates the selected fan speed. AUTO or one of five fan speed levels (LOW ▂ , LOW+ ▂▃ , MED ▂▃▅ , MED+ ▂▃▅▆ , HIGH ▂▃▅▆▇) can be indicated.
Indicates AUTO when the operating mode is either AUTO or 💧 : Dry.

⑥ **TIMER and clock time display**
The time set for timer operation or clock time is indicated.
The present time is always indicated except for TIMER operation.

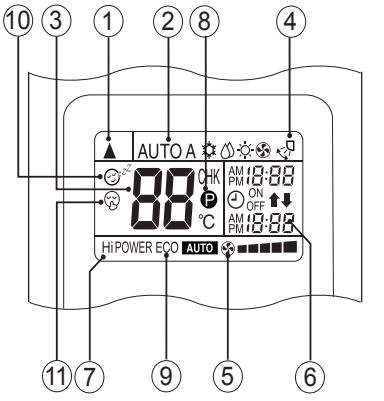
⑦ **Hi POWER display**
Indicates when the Hi POWER operation starts.
Push the [Hi POWER] button to start and push it again to stop the operation.

⑧ **PRESET display**
Flashes for 4 seconds when the [PRESET] button is pushed and hold to memorize.
Ⓟ mark is indicated when [PRESET] button is pushed than 4 seconds.
Push another button to turn off the mark.

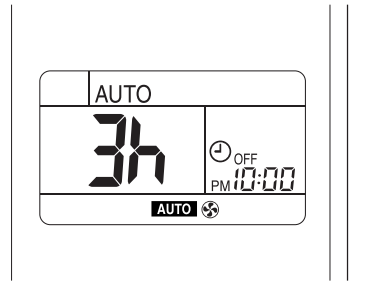
⑨ **ECO display**
Indicates when the ECO is in operation.

⑩ **COMFORT SLEEP display**
Indicates when the COMFORT SLEEP is in operation.
Each time you push the [COMFORT SLEEP] button, the display changes in the sequence of 1, 3, 5 or 9h.

⑪ **QUIET display**
Indicates when the QUIET is in operation.



- In the illustration, all indications are indicated for explanation. During operation, only the relevant indications will be indicated on the remote control.



7. INSTALLATION PROCEDURE

7-1. Safety Cautions

For general public use

Power supply cord of parts of appliance for Outdoor use shall be more than polychloroprene sheathed flexible cord (design H07RN-F), or cord designation 245IEC66. (1.5 mm^2 or more)

CAUTION **New Refrigerant Air Conditioner Installation**

- **THIS AIR CONDTIONER ADOPTS THE NEW HFC REFRIGERANT (R-410A) WHICH DOES NOT DESTROY OZONE LAYER.**

R-410A refrigerant is apt to be affected by impurity such as water, oxidizing membrane, and oils because pressure of R-410A refrigerant is approx. 1,6 times of refrigerant R-22. Accompanied with adoption of the new refrigerant, refrigerating machine oil has been also changed. Therefore, during installation work, be sure that water, dust, former refrigerant, or refrigerating machine oil does not enter into the refrigerating cycle or new-refrigerant air coditioner.
To prevent mixin of refrigerant or refrigerating machine oil, the sizes of connecting sections of charging port of the main unit or installation tools are different from those for the coventional refrigerant. Accordingly, the exclusive tools are required for the new refrigerant (R-410A) as shown below.
For conecting pipes, use new and clean piping materials with high pressure-tight force, which were made fro R-410A only, so that water or dust does not enter. Moreover, do not use the existing piping because there are problems about pressure-tight forec and inner impurity in the existing piping.

CAUTION **TO DISCONNECT THE APPLIANCE FROM THE MAIN POWER SUPPLY.**

This appliance must be connected to the main power supply by means of a circuit breaker or a switch with a contact separation of at least 3 mm.
The installation fuse (25A) must be used for the power supply line of this air conditioner.

DANGER

- FOR USE BY QUALIFIED PERSONS ONLY.
- TURN OFF MAIN POWER SUPPLY BEFORE ATTEMPTING ANY ELECTRICAL WORK. MAKE SURE ALL POWER SWITCHES ARE OFF. FAILURE TO DO SO MAY CAUSE ELECTRIC SHOCK.
- CONNECT THE CONNECTING CABLE CORRECTLY. IF THE CONNECTING CABLE IS CONNECTED BY WRONG WAY, ELECTRIC PARTS MAY BE DAMAGED.
- CHECK THE EARTH WIRE IS NOT BROKEN OR DISCONNECTED BEFORE INSTALLATION.
- DO NOT INSTALL NEAR CONCENTRATIONS OF COMBUSTIBLE GAS OR GAS VAPORS. FAILURE TO FOLLOW THIS INSTRUCTION CAN RESULT IN FIRE OR EXPLOSION.
- TO PREVENT OVERHEATING THE INDOOR UNIT AND CAUSING A FIRE HAZARD, PLACE THE UNIT WELL AWAY (MORE THAN 2 M) FROM HEAT SOURCES SUCH AS RADIATORS, HEAT REGISTORS, FURNACE, STOVES, ETC.
- WHEN MOVING THE AIR-CONDITIONER FOR INSTALLING IT IN ANOTHER PLACE AGAIN, BE VERY CAREFUL NOT TO GET THE SPECIFIED REFRIGERANT WITH ANY OTHER GASEOUS BODY INTO THE REFRIGERATION CYCLE. IF AIR OR ANY OTHER GAS IS MIXED IN THE REFRIGERANT, THE GAS PRESSURE IN THE REFRIGERATION CYCLE BECOMES ABNORMALLY HIGH AND IT RESULTINGLY CAUSES BURST OF THE PIPE AND INJURIES ON PERSONS.
- IN THE EVENT THAT THE REFRIGERANT GAS LEAKS OUT OF THE PIPE DURING THE INSTALLATION WORK, IMMEDIATELY LET FRESH AIR INTO THE ROOM. IF THE REFRIGERANT GAS IS HEATED BY FIRE OR SOMETHING ELSE, IT CAUSES GENERATION OF POISONOUS GAS.

WARNING

- Never modify this unit by removing any of the safety guards or by by-passing any of the safety interlock switches.
- Do not install in a place which cannot bear the weight of the unit. Personal injury and property damage can result if the unit falls.
- Before doing the electrical work, attach an approved plug to the power supply cord. And, make sure the equipment to be earthed.
- Appliance shall be installed in accordance with national wiring regulations. If you detect any damage, do not install the unit. Contact your Toshiba dealer immediately.

CAUTION

- Exposure of unit to water or other moisture before installation will result in an electrical short. Do not store in a wet basement or expose to rain or water.
- After unpacking the unit, examine it carefully for possible damage.
- Do not install in a place that can increase the vibration of the unit. Do not install in a place that can amplify the noise level of the unit or where noise and discharged air might disturb neighbors.
- To avoid personal injury, be careful when handling parts with sharp edges.
- Please read this installation manual carefully before installing the unit. It contains further important instructions for proper installation.

7-1-1. Installation/Servicing Tools **Changes in the product and components**

In the case of an air condition using R-410A, in order to prevent any other refrigerant from being charged accidentally, the service port diameter of the outdoor unit control valve (3 way valve) has been changed. (1/2 UNF 20 threads per inch)

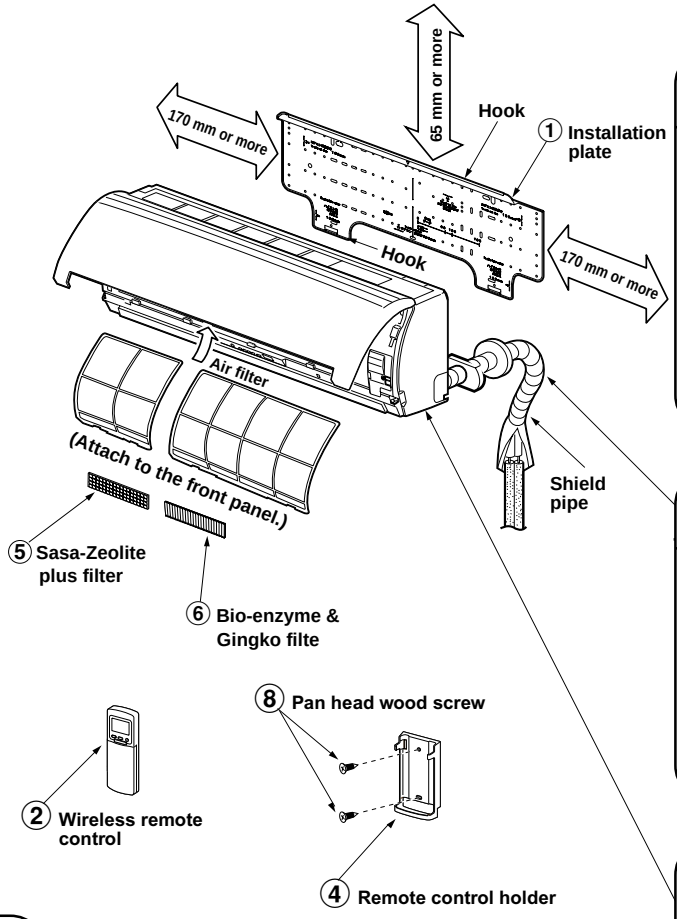
- In order to increase the pressure resisting strength of the refrigerant piping, flare processing diameter and size of opposite side of flare nuts has been changed. (for copper pipes with nominal dimensions 1/2 and 5/8)

New tools for R-410A

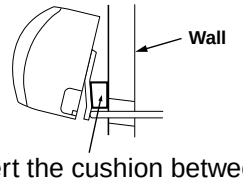
New tools for R-410A	Applicable to R-22 model		Changes
Gauge manifold	×		As pressure is high, it is impossible to measure by means of conventional gauge. In order to prevent any other refrigerant from being charged, each port diameter has been changed.
Charge hose	×		In order to increase pressure resisting strength, hose materials and port size have been changed (to 1/2 UNF 20 threads per inch). When purchasing a charge hose, be sure to confirm the port size.
Electronic balance for refrigerant charging	○		As pressure is high and gasification speed is fast, it is difficult to read the indicated value by means of charging cylinder, as air bubbles occur.
Torque wrench (nominal diam. 1/2, 5/8)	×		The size of opposite sides of flare nuts have been increased. Incidentally, a common wrench is used for nominal diameters 1/4 and 3/8.
Flare tool (clutch type)	○		By increasing the clamp bar's receiving hole, strength of spring in the tool has been improved.
Gauge for projection adjustment	—		Used when flare is made by using conventional flare tool.
Vacuum pump adapter	○		Connected to conventional vacuum pump. It is necessary to use an adapter to prevent vacuum pump oil from flowing back to the charge hose. The charge hose connecting part has two ports-one for conventional refrigerant (7/16 UNF 20 threads per inch) and one for R410A. If the vacuum pump oil (mineral) mixes with R-410A a sludge may occur and damage the equipment.
Gas leakage detector	×		Exclusive for HFC refrigerant.

- Incidentally, the “refrigerant cylinder” comes with the refrigerant designation (R-410A) and protector coating in the U.S's ARI specified rose color (ARI color code: PMS 507).
- Also, the “charge port and packing for refrigerant cylinder” require 1/2 UNF 20 threads per inch corresponding to the charge hose's port size.

7-2. Installation Diagram of Indoor Units

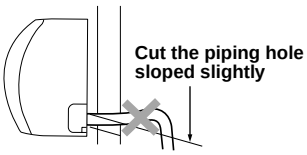


For the rear left and left piping



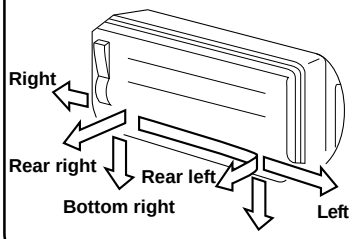
Insert the cushion between the indoor unit and wall, and tilt the indoor unit for better operation.

Do not allow the drain hose to get slack.



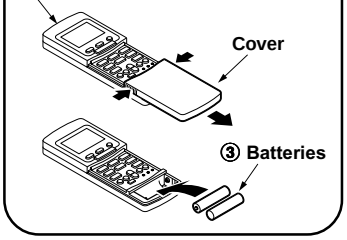
Make sure to run the drain hose sloped downward.

The auxiliary piping can be connected the left, rear left, rear right, right, bottom right or bottom left.

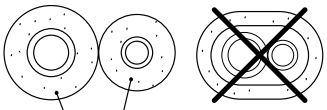


Before installing the wireless remote control

- **With the remote control cover open, load the batteries supplied correctly, observing their polarity.**

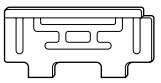
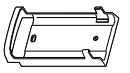
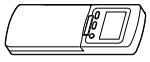
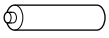


Insulate the refrigerant pipes separately with insulation, not together.



6 mm thick heat resisting polyethylene foam

7-3-2. Accessory and installation parts

Part No.	Part name (Q'ty)	Part No.	Part name (Q'ty)	Part No.	Part name (Q'ty)
①	 Installation plate x 1	④	 Remote control holder x 1	⑦	Mounting screw ∅4 x 25 l x 6
②	 Wireless remote control x 1	⑤	Sasa-Zeolite plus filter x 1	⑧	Pan head wood screw ∅3.1 x 16 l x 2
③	 Battery x 2	⑥	Bio-enzyme & Ginko filter x 1	⑨	B B Label x 1

Others	Name
	Owner's manual
	Installation manual

This model is not equipped with an extension drain hose.

Option :
For the extension drain hose, use an optionally available RB-821SW or commercially available one.

7-2-2. Installation Place

- A place which provides the spaces around the indoor unit as shown in the above diagram.
- A place where there is no obstacle near the air inlet and outlet.
- A place which allows easy installation of the piping to the outdoor unit.
- A place which allows the front panel to be opened.
- The indoor unit shall be installed as top of the indoor unit comes to at least 2m height.
  Also it must be avoided to put anything on the top of the indoor unit.

CAUTION

- Direct sunlight to the indoor unit wireless receiver should be avoided.
- The microprocessor in the indoor unit should not be too close to r-f noise sources.
  (For details, see the owner's manual.)

Remote controller

- A place where there are no obstacles such as a curtain that may block the signal from the indoor unit.
- Do not install the remote control in a place exposed to direct sunlight or close to a heating source, such as a stove.
- Keep the remote control at least 1 m apart from the nearest TV set or stereo equipment. (This is necessary to prevent image disturbances or noise interference.)
- The location of the remote control should be determined as shown below.

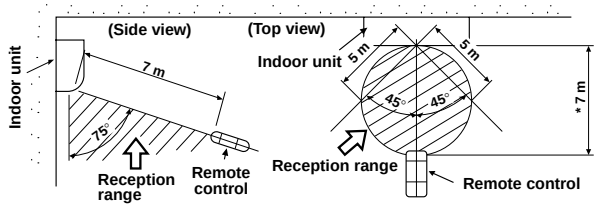


Fig. 7-2-1

7-2-3. Cutting a Hole and Mounting Installation Plate

Cutting a Hole

When install the refrigerant pipes from the rear.

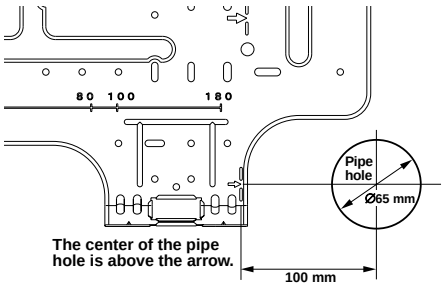


Fig. 7-2-2

1. After determining the pipe hole position on the mounting plate (➡) drill the pipe hole (∅65 mm) at a slight downward slant to the outdoor side.

NOTE

- When drilling a wall that contains a metal lath, wire lath or metal plate, be sure to use a pipe hole brim ring sold separately.

Mounting the Installation Plate

For installation of the indoor unit, use the paper pattern on the back.

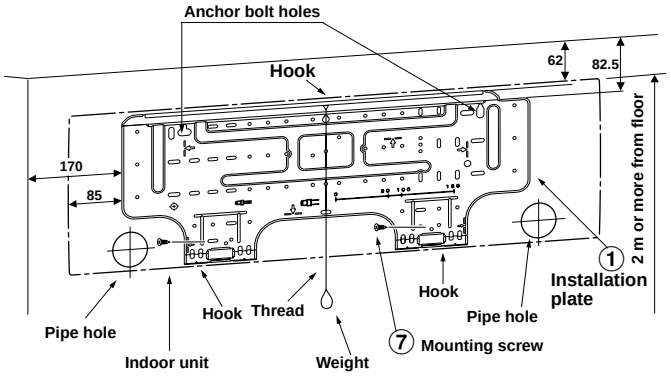


Fig. 7-2-3

When the installation plate is directly mounted on the wall

1. Securely fit the installation plate onto the wall by screwing it in the upper and lower parts to hook up the indoor unit.
2. To mount the installation plate on a concrete wall with anchor bolts, utilize the anchor bolt holes as illustrated in the above figure.
3. Install the installation plate horizontally in the wall.

CAUTION

When installing the installation plate with a mounting screw, do not use the anchor bolt hole. Otherwise the unit may fall down and result in personal injury and property damage.

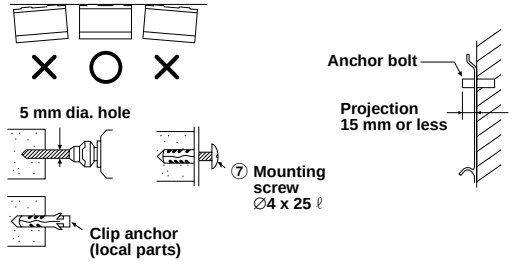


Fig. 7-2-4

CAUTION

Failure to firmly install the unit may result in personal injury and property damage if the unit falls.

- In case of block, brick, concrete or similar type walls, make 5 mm dia. holes in the wall.
- Insert clip anchors for appropriate ⑦ mounting screws.

NOTE

- Install the installation plate using 4 to 6 pieces of mounting screw securing four corners with screws.

7-2-4. Electrical Work

1. The supply voltage must be the same as the rated voltage of the air conditioner.
2. Prepare the power source for exclusive use with the air conditioner.

NOTE

- Wire type : More than H07RN-F or 245IEC66 (1.0 mm^2 or more)

CAUTION

- This appliance can be connected to the mains in either of the following two ways.
  (1) Connection to fixed wiring :
  A switch or circuit breake which disconnects all poles and has a contact separation of at least 3 mm must be incorporate in the fixed wiring. An approved circuit breaker or switches must used.
  (2) Connection with power supply plug :
  Attach power supply plug with power cord and plug it into wall outlet. An approved power supply cord and plug must be used.

NOTE

- Perform wiring works so as to allow a generous wiring capacity.

7-2-5. Wiring Connection

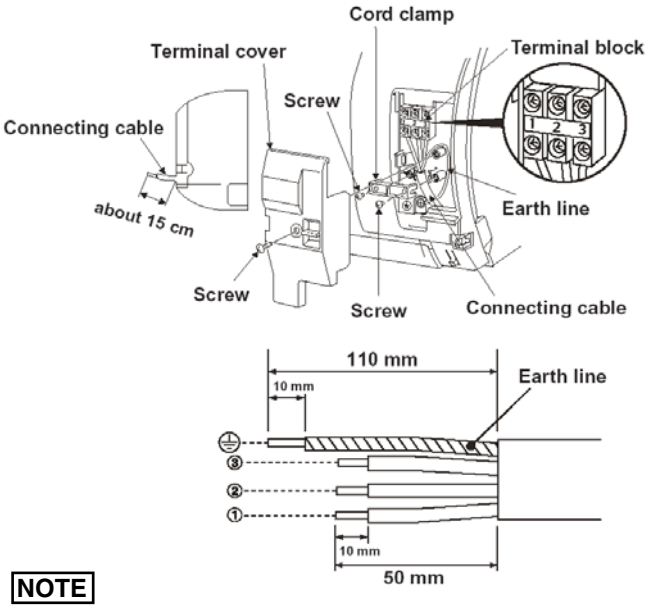
How to connect the connecting cable

Wiring of the connecting cable can be carried out without removing the front panel.

1. Remove the air inlet grille.
   Open the air inlet grille upward and pull it toward you.
2. Remove the terminal cover and cord clamp.
3. Insert the connecting cable (according to the local cords) into the pipe hole on the wall.
4. Take out the connecting cable through the cable slot on the rear panel so that it protrudes about 15 cm from the front.
5. Insert the connecting cable fully into the terminal block and secure it tightly with screws.
6. Tightening torque :1.2 N·m (0.12 kgf·m)
7. Secure the connecting cable with the cord clamp.
8. Fix the terminal cover, rear plate bushing and air inlet grille on the indoor unit.

CAUTION

- Be sure to refer to the wiring system diagram labeled inside the front panel.
- Check local electrical cords and also any specific wiring instructions or limitations.



NOTE

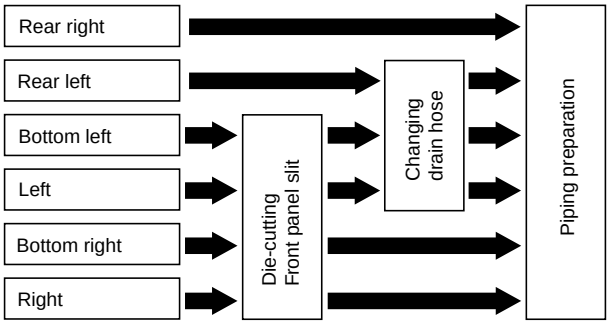
- Use stranded wire only.
- Wire type : H07RN-F or more.

Fig. 7-2-5

7-2-6 Piping and Drain Hose Installation

Piping and Drain Hose Forming

* Since dewing results in a machine trouble, make sure to insulate both the connecting pipes. (Use polyethylene foam as insulating material.)



1. Die-cutting Front panel slit

Cut out the slit on the left or right side of the front panel for the left or right connection and the slit on the bottom left or right side of the front panel for the bottom left or right connection with a pair of nippers.

2. Changing drain hose

For left connection, left-bottom connection and rear-left connection's piping, it is necessary to change the drain hose and drain cap.

How to remove the Drain Cap

Clip drain cap by needle-nose plier, and pull out.

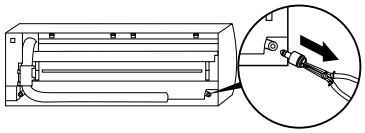


Fig. 7-2-6

How to install the Drain Hose

Firmly insert drain hose connecting part until hitting on a heat insulator.

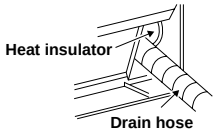


Fig. 7-2-7

How to fix the Drains Cap

1) Insert hexagonal wrench (4 mm) in a center head.

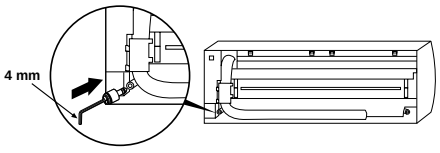


Fig. 7-2-8

2) Firmly insert drains cap.

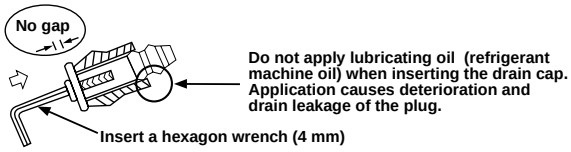

No gap
Do not apply lubricating oil (refrigerant machine oil) when inserting the drain cap. Application causes deterioration and drain leakage of the plug.
Insert a hexagon wrench (4 mm)

Fig. 7-2-9

CAUTION

Firmly insert the drain hose and drain cap; otherwise, water may leak.

In case of right or left piping

- After scribing slits of the front panel with a knife or a making-off pin, cut them with a pair of nippers or an equivalent tool.

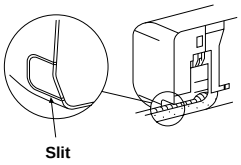


Fig. 7-2-10

In case of bottom right or bottom left piping

- After scribing slits of the front panel with a knife or a making-off pin, cut them with a pair of nippers or an equivalent tool.

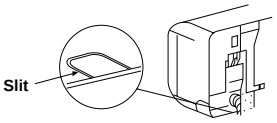


Fig. 7-2-11

Left-hand connection with piping

Bend the connecting pipe so that it is laid within 43 mm above the wall surface. If the connecting pipe is laid exceeding 43 mm above the wall surface, the indoor unit may unstably be set on the wall. When bending the connecting pipe, make sure to use a spring bender so as not to crush the pipe.

Bend the connection pipe within a radius of 30 mm (Ø6.35) 40 mm (Ø9.52).

To connect the pipe after installation of the unit (figure)

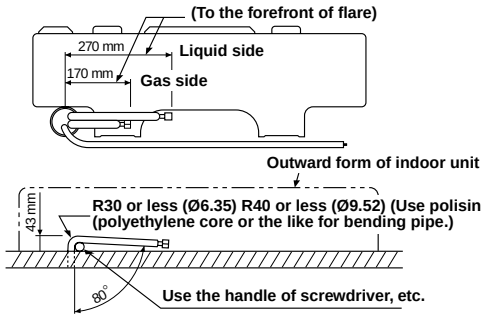

(To the forefront of flare)
270 mm
Liquid side
170 mm
Gas side
Outward form of indoor unit
43 mm
R30 or less (Ø6.35) R40 or less (Ø9.52) (Use polisin (polyethylene core or the like for bending pipe.)
80°
Use the handle of screwdriver, etc.

Fig. 7-2-12

NOTE

If the pipe is bent incorrectly, the indoor unit may unstably be set on the wall.
After passing the connecting pipe through the pipe hole, connect the connecting pipe to the auxiliary pipes and wrap the facing tape around them.

CAUTION

- Bind the auxiliary pipes (two) and connecting cable with facing tape tightly. In case of leftward piping and rear-leftward piping, bind the auxiliary pipes (two) only with facing tape.

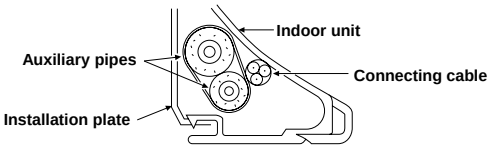


Fig. 7-2-13

- Carefully arrange pipes so that any pipe does not stick out of the rear plate of the indoor unit.
- Carefully connect the auxiliary pipes and connecting pipes to each other and cut off the insulating tape wound on the connecting pipe to avoid double-taping at the joint, moreover, seal the joint with the vinyl tape, etc.
- Since dewing results in a machine trouble, make sure to insulate both the connecting pipes. (Use polyethylene foam as insulating material.)
- When bending a pipe, carefully do it not to crush it.

7-2-6 Indoor Unit Fixing

1. Pass the pipe through the hole in the wall, and hook the indoor unit on the installation plate at the upper hooks.
2. Swing the indoor unit to right and left to confirm that it is firmly hooked up on the installation plate.
3. While pressing the indoor unit onto the wall, hook it at the lower part on the installation plate. Pull the indoor unit toward you to confirm that it is firmly hooked up on the installation plate.

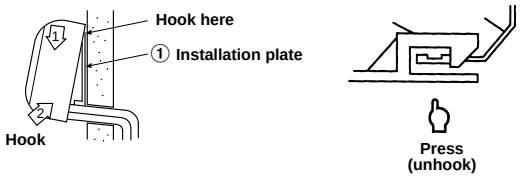


Fig. 7-2-14

- For detaching the indoor unit from the installation plate pull the indoor unit toward you while pushing its bottom up at the specified parts.

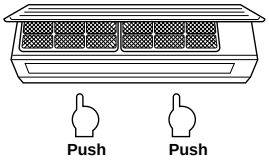


Fig. 7-2-15

7-2-7 Drainage

1. Run the drain hose sloped downwards.

NOTE

- Hole should be made at a slight downward slant on the outdoor side.

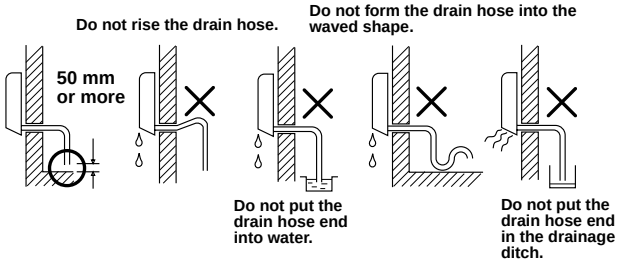

Do not rise the drain hose.
Do not form the drain hose into the waved shape.
50 mm or more
Do not put the drain hose end into water.
Do not put the drain hose end in the drainage ditch.

Fig. 7-2-16

2. Put water in the drain pan and make sure that the water is drained out of doors.
3. When connecting extension drain hose, insulate the connecting part of extension drain hose with shield pipe.

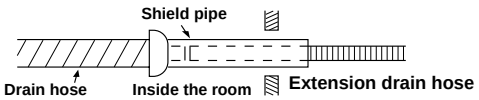


Fig. 7-2-17

CAUTION

Arrange the drain pipe for proper drainage from the unit.
Improper drainage can result in dew-dropping.

This air conditioner has the structure designed to drain water collected from dew, which forms on the back of the indoor unit, to the drain pan.
Therefore, do not store the power cord and other parts at a height above the drain guide.

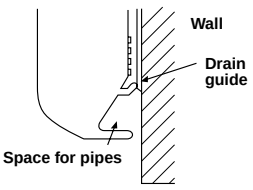


Fig. 7-2-18

7-2-8. Setting of Remote Controller Selector Switch

When two indoor units are installed in the separated rooms, there is no need to change the select switches.

Remote Controller Selector Switch

- When two indoor units are installed in the same room or adjacent two rooms, if operating a unit, two units may receive the remote controller signal simultaneously and operate. In this case, the operation can be preserved by setting either one indoor unit and remote controller to B setting
  (Both are set to A setting in factory shipment).
- The remote control signal is not received when the settings of indoor unit and remote controller are different.
- There is no relation between A setting/B setting and A room/B room when connecting the piping and cables.

1. Setting of remote controller switch at the indoor unit side

How to remove the front cabinet

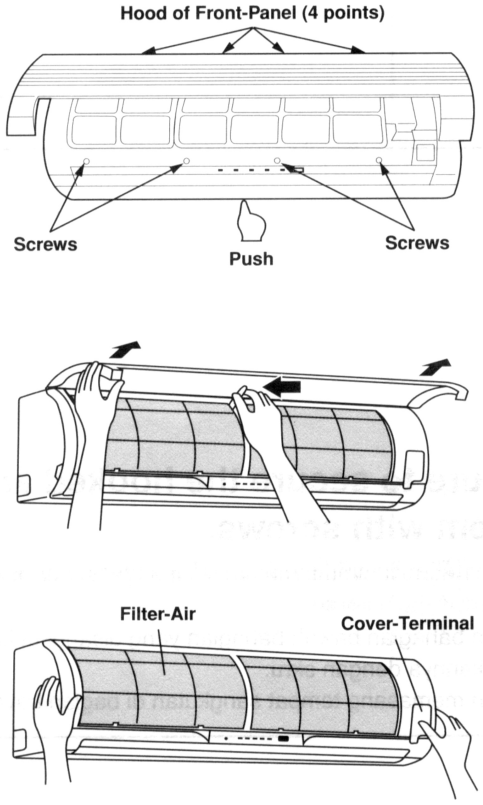
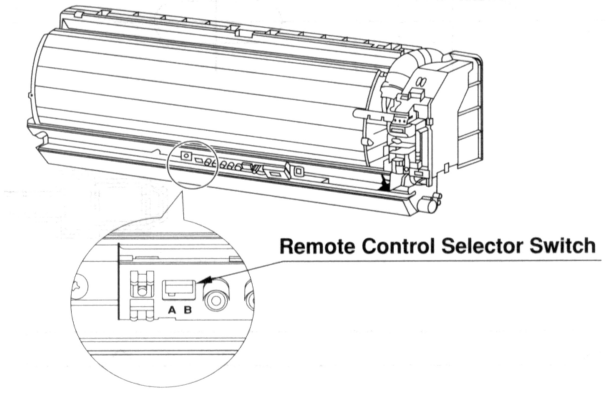


Fig. 7-2-19

(1) Stop the operation of the air conditioner and turn turn off its main power supply.
(2) Pull the air inlet grille toward you to open it and remove the air inlet grille.
(3) First open the horizontal louver and then remove the front panel from the back body by pulling it toward you.

Position of Remote Control Selector Switch



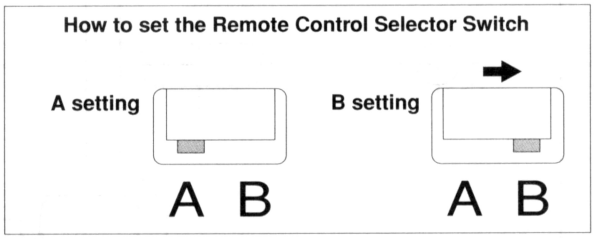


Fig. 7-2-20

How to mount the front panel

Push the front panel back in and make sure all hook are locked.

Adhesion of B label (When setting to [B])

Be sure to affix the B label on the front panel same asthe below figure.

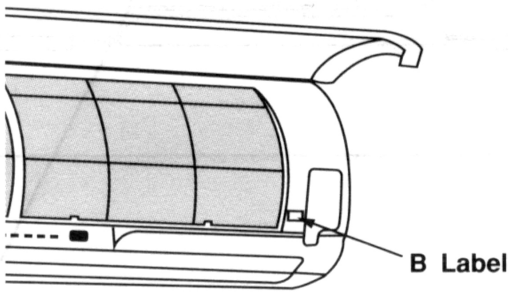


Fig. 7-2-21

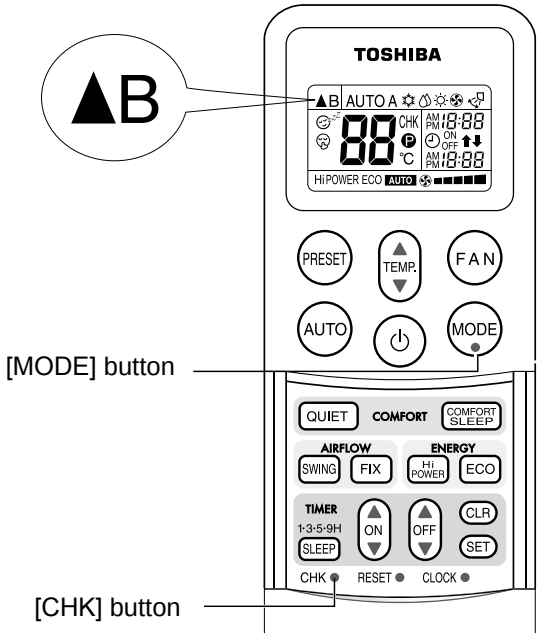
2. Setting of remote controller selector at the remote controller side

[B] of the remote controller is displayed with liquid crystal only when it is set to [B].
There is no display of [A].

- Enter the batter.
- Push the [CHK] button by something with thin edge. ([00] is displayed.)
- If [MODE] button is pushed while pushing [CHK] button, the small [B] is displayed at the right of the setting temperature indication section.

  * To reset [A] setting, push the [MODE] button again while pusing the [CHK] button.

3. Confirm the indoor unit can operate with the changed setting of the remote controller.



* The above remote controller is one for cooling only model.

7-2-9. Check and Test Operation

1. Check the unit is firmly hooked up on the installation plate.
2. Check the connecting pipes tightened securely.

   Confirm that there is no gas leakage.
3. Confirm that all connecting cables are secured and correct.
4. Check the pipes insulation.
5. Check the drainage.
6. Connection of the grounding wire.
7. To switch the TEST RUN (COOL) mode, turn the switch on.

   To switch the TEST RUN (COOL) mode, press TEMPORARY button for 10 sec. (The beeper will make a short beep.)

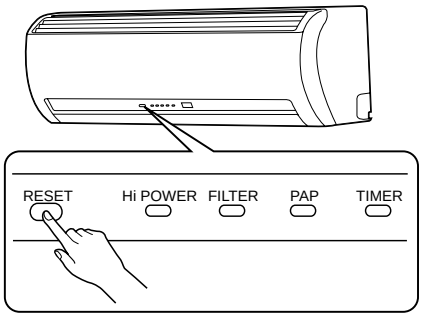


Fig. 7-2-23

8. Operate the unit at cooling operation mode for fifteen minutes or more.

   Measure the temperature of the intake and discharge air. Ensure the difference between the intake temperature and the discharge one is more, than 8°C.

   NOTE: Three-minutes protection feature

   A protection feature prevents the air conditioner from being activated for about 3 minutes when it is restarted immediately after operation or when the power switch is turned on.
9. Check the remote controller operation.

When finished the check and test operation, make sure to return to REMOTE CONTROLLER. (Push the temporary switch with once again.)

10. Explain to the customer on the correct usage of air conditioner simple layman's terms.

8. HOW TO DIAGNOSE THE TROUBLE

The pulse modulating circuits are mounted to both indoor and outdoor units. Therefore, diagnose troubles according to the trouble diagnosis procedure as described below. (Refer to the check points in servicing written on the wiring diagrams attached to the indoor/outdoor units.)

8-1. First Confirmation

8-1-1. Confirmation of Power Supply

Confirm that the power breaker operates (ON) normally.

8-1-2. Confirmation of Power Voltage

Confirm that power voltage is AC 220 – 240V ± 10%. If power voltage is not in this range, the unit may not operate normally.

8-1-3. Operation Which is not a Trouble (Program Operation)

For controlling the air conditioner, the program operations are built in the microcomputer as described in the following table. If a claim is made for running operation, check whether or not it meets to the contents in the following table. When it does, we inform you that it is not trouble of equipment, but it is indispensable for controlling and maintaining of air conditioner.

Table 8-1-1

No.	Operation of air conditioner	Description
1	When power breaker is turned "ON", the operation lamp (Green) of the indoor unit flashes.	The OPERATION lamp of the indoor unit flashes when power source is turned on. If [⏻] button is operated once, flashing stops. (Flashes also in power failure)
2	Compressor may not operate even if the room temperature is within range of compressor-ON.	The compressor does not operate while compressor restart delay timer (3-minutes timer) operates. The same phenomenon is found after power source has been turned on because 3-minutes timer operates.
3	In DRY and ECONO. mode, FAN (air flow) display does not change even though FAN (air flow select) button is operated.	The air flow indication is fixed to [AUTO].
4	Increasing of compressor motor speed stops approx. 30 seconds after operation started, and then compressor motor speed increases again approx. 30 seconds after.	For smooth operation of the compressor, the compressor motor speed is restricted to Max. 33 rps for 2 minutes and Max. 57 rps for 2 minutes to 4 minutes, respectively after the operation has started.
5	The set value of the remote control should be below the room temperature.	If the set value is above the room temperature, Cooling operation is not performed. And check whether battery of the remote control is consumed or not.

8-2. Primary Judgment

To diagnose the troubles, use the following methods.

(1) Judgment by flashing LED of indoor unit

(2) Self-diagnosis by service check remote controller

(3) Judgment of trouble by every symptom

Firstly use the method (1) for diagnosis. Then, use the method (2) or (3) to diagnose the details of troubles.

For any trouble occurred at the outdoor unit side, detailed diagnosis is possible by 5-serial LED on the inverter P.C. board.

8-3. Judgment by Flashing LED of Indoor Unit

While the indoor unit monitors the operation status of the air conditioner, if the protective circuit operates, the contents of self-diagnosis are displayed with block on the indoor unit indication section.

Table 8-3-1

	Lamps	Self-diagnosis
A	OPERATION lamp is blinking. (1Hz)	Power failure (when the power supply is turning on)
B	OPERATION lamp is blinking. (5Hz)	Thermo sensor (TA) short or break
C	OPERATION lamp is blinking. (5Hz)	Heat exchanger sensor (TC) short or break
D	OPERATION lamp is blinking. (5Hz)	Indoor fan motor lock or failure
E	OPERATION lamp is blinking. (5Hz)	Indoor P.C. board failure
F	OPERATION and TIMER lamps are blinking. (5Hz)	Wrong wiring of connecting cable
G	OPERATION, TIMER and FAN ONLY lamps are blinking.	• Gas shortage or other refrigerant cycle trouble • Heat exchanger sensor open, break or short • Overload relay or thermostat trouble of compressor
H	OPERATION, TIMER and FAN ONLY lamps are blinking.	Cycle failure

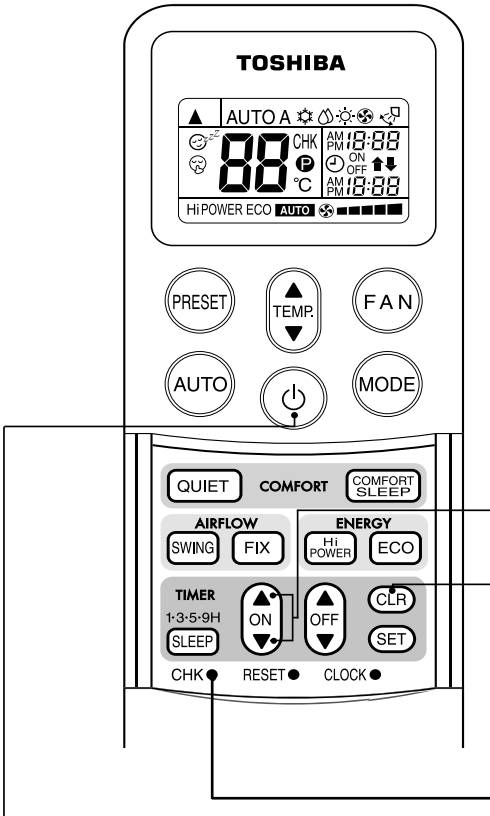
NOTES:

(1) The contents of items B and C and a part of item E are displayed when air conditioner operates.
(2) When item B and C, and item B and a part of item E occur concurrently, priority is given to the block of item B.
(3) The check codes can be confirmed on the remote controller for servicing.
(4) When connecting the changing kit, first-push priority control is executed. The secondary operation lamp continues flashing. For details, refer to the section 10. Changing Kit.

8-4. Self-Diagnosis by Remote Control (Check Code)

(1) If the lamps are indicated as shown B to G in Table 9-3-1, exchanger the self-diagnosis by the remote control.
(2) When the remote control is set to the service mode, the indoor controller diagnoses the operation condition and indicate the information of the self-diagnosis on the display of the remote control with the check codes. If a fault is detected, all lamps on the indoor unit will blink at 5Hz and it will beep for 10 seconds (Pi, Pi, Pi....). The timer lamp usually blinks (5Hz) during the self-diagnosis.

8-4-1. How to use remote control in service mode



(1) Press [CHK] button with a tip of pencil to set the remote control to the service mode.
- "00" is indicated on the display of the remote control.
- The timer lamp on the indoor unit blinks continuously. (5 times per 1 sec.)

(2) Press [TIMER ▲] button.
If there is no fault with a code, the indoor unit will beep once (Pi) and the display of the remote control will change as follows:

→ 00 → 01 → 02 ··· 1d → 1E → 22 →

- Check the unit with all 35 check codes (00 to 22). as shown in Table 9-4-1.
- Press [TIMER ▼] button to change the check code backwards.

If there is a fault, the indoor unit will beep for 10 seconds (Pi, Pi, Pi...).
Note the check code on the display of the remote control.
- 2-digits alphanumeric will be indicated on the display.
- All lamps on the indoor unit will blink. (5 times per 1 sec.)

(3) Press [CLR] button. After service finish for clear service code in memory.
- "7F" is indicated on the display of the remote control.

(4) Press [⏻] button to release the service mode.
- The display of the remote control returns to as it was before service mode was engaged.

- Alphanumeric characters are used for the check code.

5	is 5.	6	is 6.
A	is A.	b	is B.
C	is C.	d	is D.

* This illustration in only for Heat pump model.
For Cooling only model, there is not the (☼) symbol.

8-4-2. Caution at Servicing

(1) After servicing, push the [⏻] button to return to the normal mode.

(2) After servicing by the check code, turn off breaker of the power supply, and turn on breaker of the power supply again so that memory in the microcomputer returns the initial status. However, the check codes are not deleted even if the power supply is turned off because they are stored in the fixed memory.

Table 10-4-1

Block distinction		Operation of diagnosis function				Judgment and action
Check code	Block	Check code	Cause of operation	Air conditioner status	Condition	
00	Indoor P.C. board etc.	01	Short-circuit or disconnection of the room temperature sensor (TA sensor).	Operation continues.	Displayed when error is detected.	1. Check the room temp. sensor. 2. When the room temp. sensor is normal, check P.C. board.
		0d	Coming-off, disconnection, short-circuit, or migration of heat exchanger sensor (TC sensor)	Operation continues.	Displayed when error is detected.	1. Check heat exchanger sensor. 2. When heat exchanger sensor is normal, check P.C. board.
		11	Lock of indoor fan or trouble on the indoor fan circuit	All off	Displayed when error is detected.	1. Check P.C. board. 2. When P.C. board is normal, check the motor.
	Not displayed	12	Trouble on other indoor P.C. boards	Operation continues.	Displayed when error is detected.	Replace P.C. board.
01	Connecting cable and serial signal	04	Return serial signal is not sent to indoor side from operation started. (1) Defective wiring of connecting cable (2) Operation of compressor thermo. Gas shortage Gas leak	Operation continues.	Flashes when trouble is detected on Return serial signal, and normal status when signal is reset.	1. When the outdoor unit never operate: (1) Check connecting cable, and correct if defective wiring. (2) Check 25A (or 30A) fuse (F01) of outdoor main P.C. board. (3) Check 3.15A fuse (F04) of outdoor main P.C. board. 2. To display [Other] block during operation, check compressor thermo. operation and supply gas (check gas leak also). 3. Unit operates normally during check. If Return serial signal does not stop between indoor terminal board 2 and 3, replace inverter P.C. board. If signal stops between indoor terminal board 2 and 3, replace indoor P.C. board.
		05	Operation command signal is not sent to outdoor side.	Operation continues.	Flashes when trouble is detected on Operation command signal, and normal status when signal is reset.	If Operation command signal does not stop between indoor terminal board 2 and 3, replace inverter P.C. board. If signal stops between indoor terminal board 2 and 3, replace indoor P.C. board.

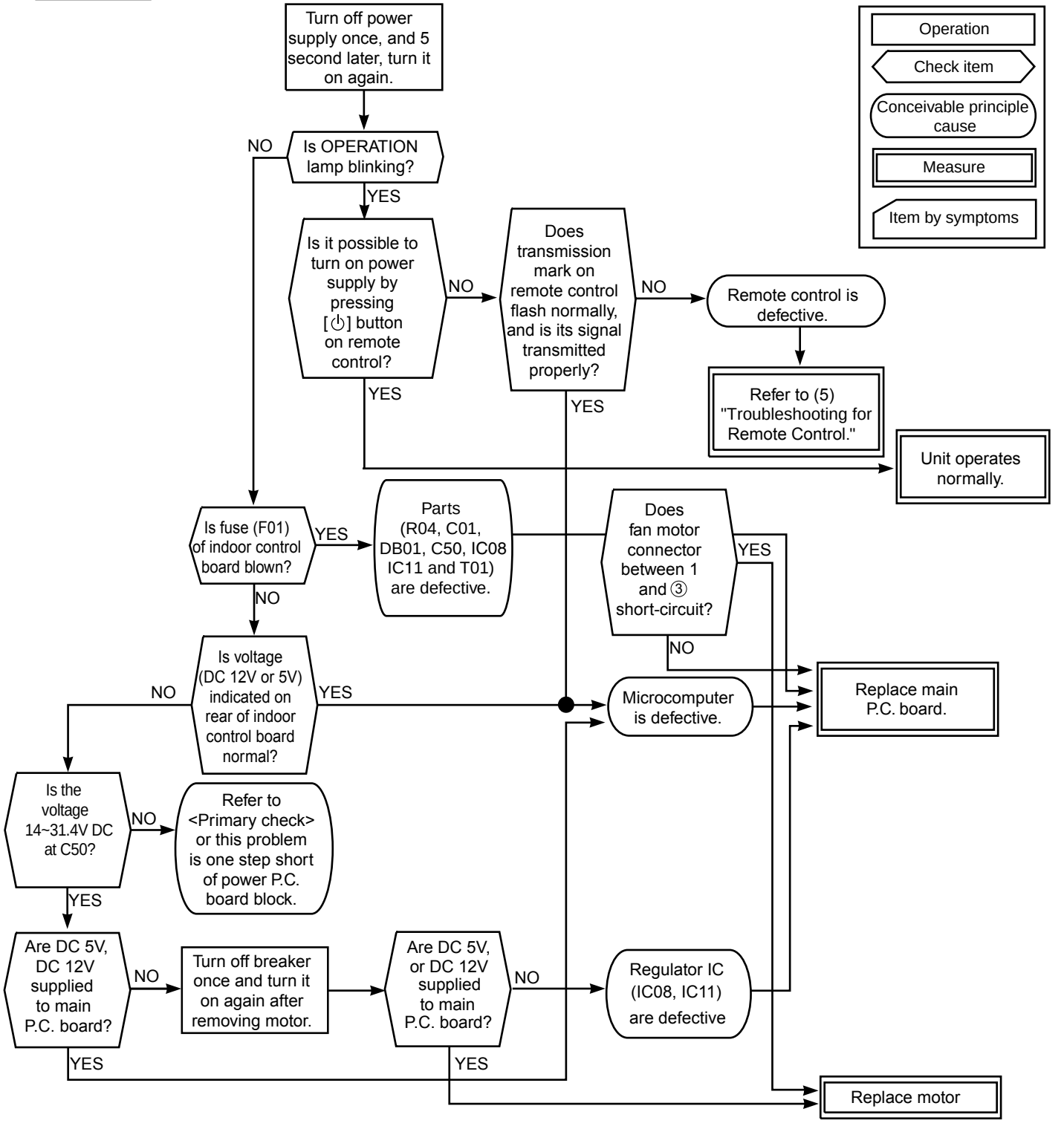
Block distinction		Operation of diagnosis function				Judgment and action
Check code	Block	Check code	Cause of operation	Air conditioner status	Remarkes	
02	Outdoor P.C. board	14	Inverter over-current protective circuit operates. (Short time)	All off	Displayed when error is detected.	Even if trying operation again, all operations stop immediately. : Replace P.C. board.
		16	Position-detect circuit error or short-circuit between windings of compressor	All off	Displayed when error is detected.	1. Even if connecting lead wire of compressor is removed, position-detect circuit error occurred. : Replace P.C. board. 2. Measure resistance between wires of compressor, and perform short-circuit. : Replace compressor.
		17	Current-detect circuit error	All off	Displayed when error is detected.	Even if trying operation again, all operations stop immediately. : Replace P.C. board.
		18	Being out of place, disconnection or short-circuit of outdoor temp. sensor	All off	Displayed when error is detected.	Check 5-serial LED. 1. Check P.C. board.
		19	Disconnection or short-circuit of discharge temp. sensor	All off	Displayed when error is detected.	1. Check discharge temp. sensor (TD). 2. Check P.C. board.
		1A	Outdoor fan drive system error	All off	Displayed when error is detected.	Position-detect error, over-current protective operation of outdoor fan drive system, fan lock, etc. : Replace P.C. board or fan motor.
	Not displayed	1b	Outdoor temp. sensor error	Operation continues.	———	1. Check outdoor temp. sensor (TO). 2. Check P.C. board.
	Outdoor P.C. board	1C	Compressor drive output error, Compressor error (lock, missing, etc.), Break down	All off	Displayed when error is detected.	Check 5-serial LED. When 20 seconds passed after start-up, position-detect circuit error occurred. : Replace compressor.
			Error exclusive for multiple type	All off	Displayed when error is detected.	Check 5-serial LED. 1. Miswiring of connecting wire of A/B/C/D rooms in indoor/outdoor units 2. Check gas leakage. 3. Check disconnection of sensor. 4. Electronic control valve error
03	Others (including compressor)	1d	Compressor does not rotate. (Current protective circuit does not operate when a specified time passed after compressor had been activated.)	All off	Displayed when error is detected.	1. Trouble on compressor 2. Trouble on wiring of compressor (Missed phase)
		1E	Discharge temp. exceeded 120°C.	All off	Displayed when error is detected.	1. Check dischage temp. sensor (TD). 2. Degassing 3. Trouble on P.M.V.
		1F	Break down of compressor	All off	Displayed when error is detected.	1. Check power voltage. (220–240 V ±10%) 2. Overload operation of refrigeration cycle Check installation condition (Short-circuit of outdoor diffuser).

8-5. Judgement of Trouble by Every Symptom

8-5-1. Indoor unit (Including remote controller)

(1) Power is not turned on (Does not operate entirely)

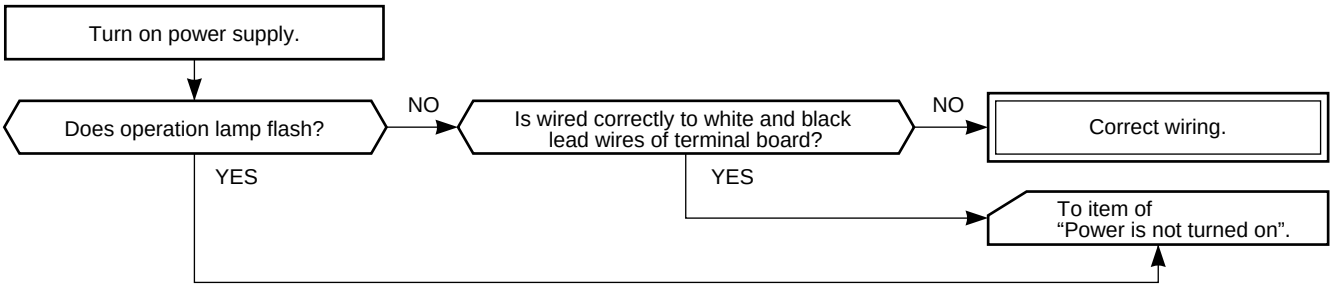
For 10/13k


Turn off power supply once, and 5 second later, turn it on again.
Is OPERATION lamp blinking?
NO
YES
Is it possible to turn on power supply by pressing [⏻] button on remote control?
NO
Does transmission mark on remote control flash normally, and is its signal transmitted properly?
NO
Remote control is defective.
Refer to (5) "Troubleshooting for Remote Control."
YES
YES
Unit operates normally.
Is fuse (F01) of indoor control board blown?
YES
Parts (R04, C01, DB01, C50, IC08 IC11 and T01) are defective.
Does fan motor connector between 1 and ③ short-circuit?
YES
NO
Is voltage (DC 12V or 5V) indicated on rear of indoor control board normal?
NO
YES
Microcomputer is defective.
Replace main P.C. board.
Is the voltage 14~31.4V DC at C50?
NO
Refer to <Primary check> or this problem is one step short of power P.C. board block.
YES
Are DC 5V, DC 12V supplied to main P.C. board?
NO
Turn off breaker once and turn it on again after removing motor.
Are DC 5V, or DC 12V supplied to main P.C. board?
NO
Regulator IC (IC08, IC11) are defective
YES
YES
Replace motor
Operation
Check item
Conceivable principle cause
Measure
Item by symptoms

- Be sure to disconnect the motor connector CN10 after shut off the power supply, or it will be a cause of damage of the motor.

(2) Power is not turned on though Indoor P.C. board is replaced

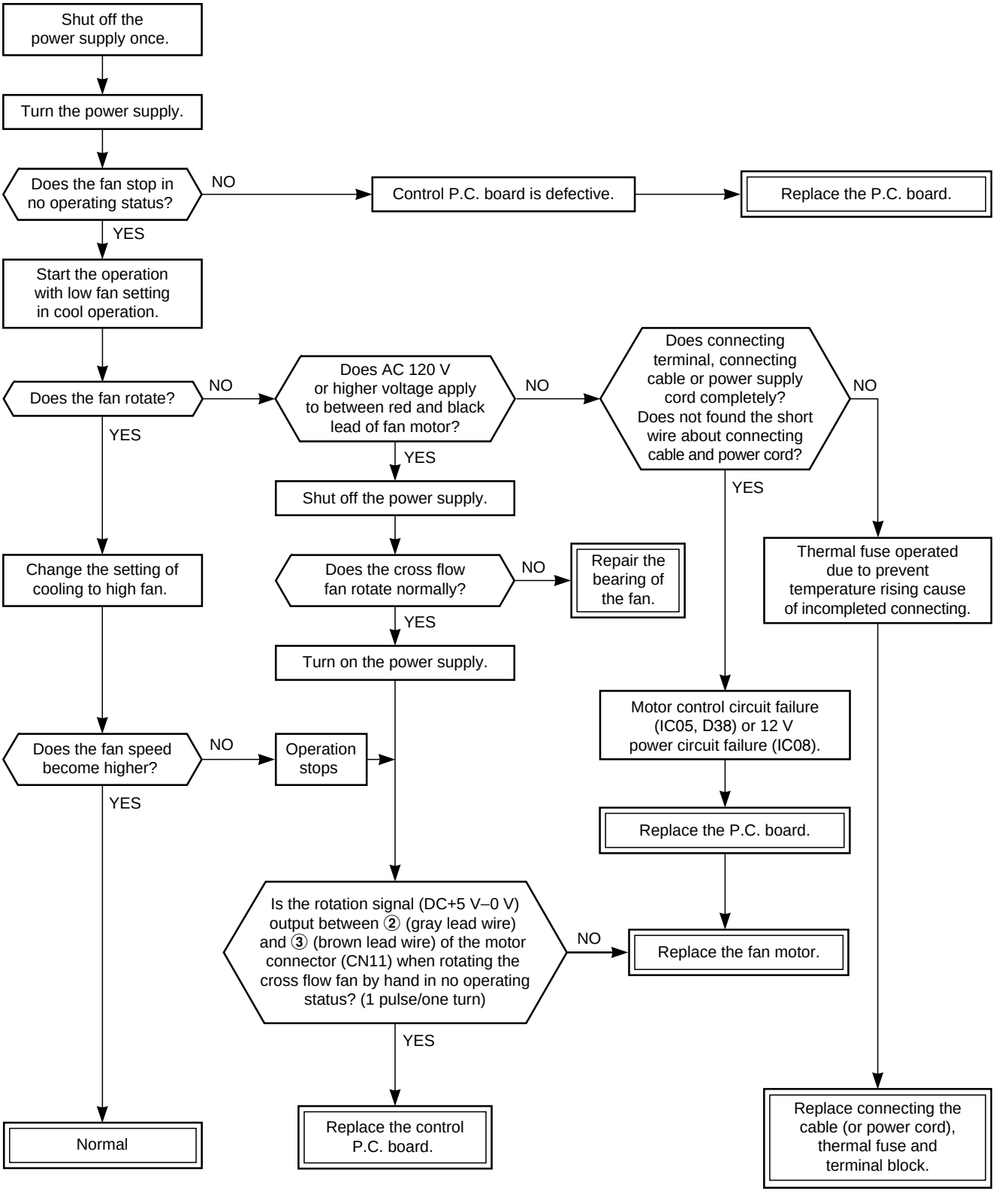
<Confirmation procedure>



(3) Only the indoor fan does not operate.

(For 10/13k)

<Check procedure>

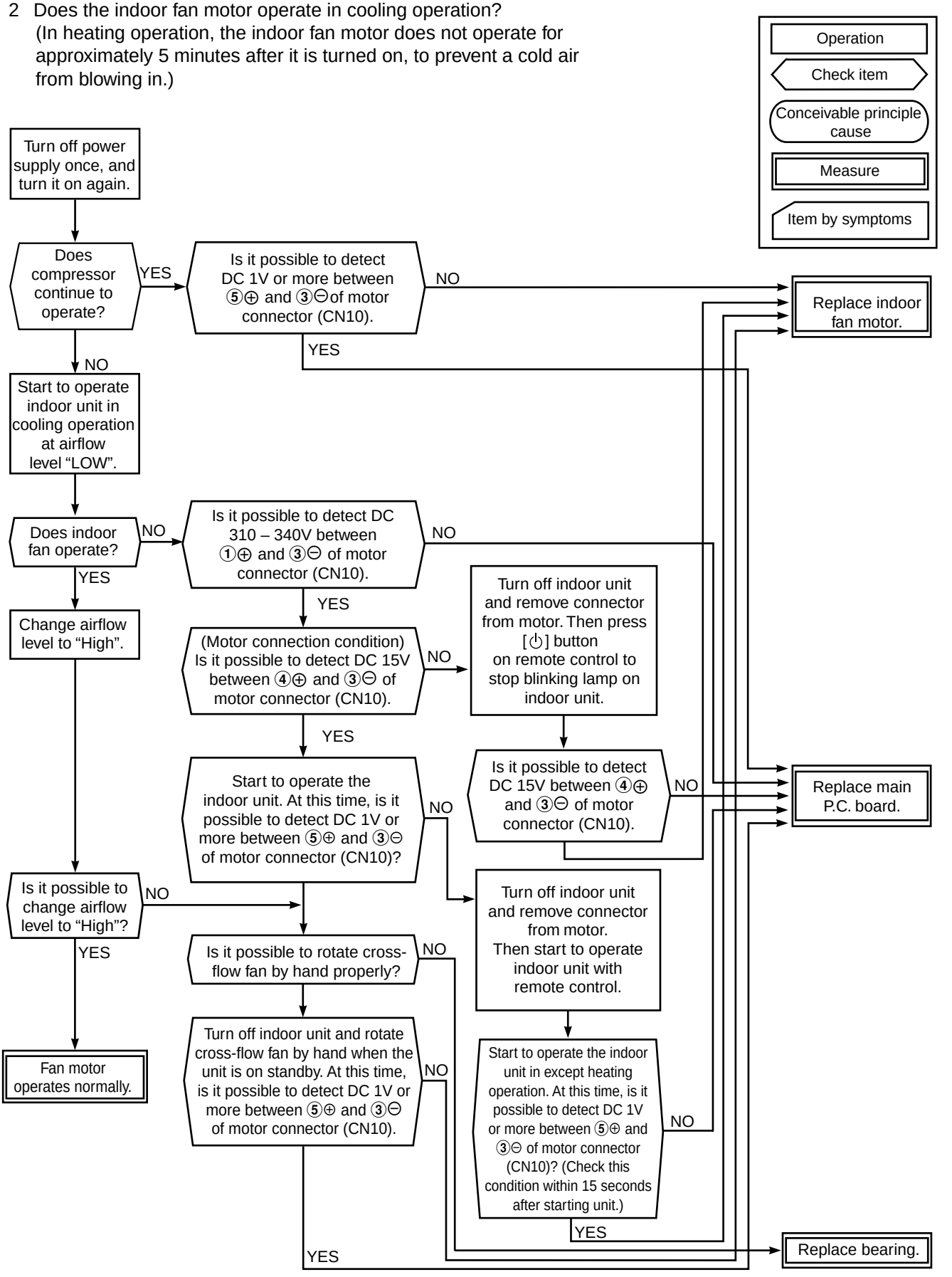

Shut off the power supply once.
Turn the power supply.
Does the fan stop in no operating status?
NO
Control P.C. board is defective.
Replace the P.C. board.
YES
Start the operation with low fan setting in cool operation.
Does the fan rotate?
NO
Does AC 120 V or higher voltage apply to between red and black lead of fan motor?
NO
Does connecting terminal, connecting cable or power supply cord completely? Does not found the short wire about connecting cable and power cord?
NO
YES
YES
Shut off the power supply.
Change the setting of cooling to high fan.
Does the cross flow fan rotate normally?
NO
Repair the bearing of the fan.
Thermal fuse operated due to prevent temperature rising cause of incompleted connecting.
YES
Turn on the power supply.
Motor control circuit failure (IC05, D38) or 12 V power circuit failure (IC08).
Does the fan speed become higher?
NO
Operation stops
YES
Replace the P.C. board.
Is the rotation signal (DC+5 V–0 V) output between ② (gray lead wire) and ③ (brown lead wire) of the motor connector (CN11) when rotating the cross flow fan by hand in no operating status? (1 pulse/one turn)
NO
Replace the fan motor.
YES
Normal
Replace the control P.C. board.
Replace connecting the cable (or power cord), thermal fuse and terminal block.

(For 16k)

<Preliminary check>

1 Is it possible to detect the power supply voltage (200 – 240V) between ① and ② on the terminal block?

2 Does the indoor fan motor operate in cooling operation?
(In heating operation, the indoor fan motor does not operate for approximately 5 minutes after it is turned on, to prevent a cold air from blowing in.)


Operation
Check item
Conceivable principle cause
Measure
Item by symptoms
Turn off power supply once, and turn it on again.
Does compressor continue to operate?
YES
Is it possible to detect DC 1V or more between ⑤⊕ and ③⊖ of motor connector (CN10).
NO
Replace indoor fan motor.
YES
NO
Start to operate indoor unit in cooling operation at airflow level "LOW".
Does indoor fan operate?
NO
Is it possible to detect DC 310 – 340V between ①⊕ and ③⊖ of motor connector (CN10).
NO
YES
Turn off indoor unit and remove connector from motor. Then press [⏻] button on remote control to stop blinking lamp on indoor unit.
YES
Change airflow level to "High".
(Motor connection condition) Is it possible to detect DC 15V between ④⊕ and ③⊖ of motor connector (CN10).
NO
YES
Is it possible to detect DC 15V between ④⊕ and ③⊖ of motor connector (CN10).
NO
Replace main P.C. board.
Start to operate the indoor unit. At this time, is it possible to detect DC 1V or more between ⑤⊕ and ③⊖ of motor connector (CN10)?
NO
Is it possible to change airflow level to "High"?
NO
YES
Turn off indoor unit and remove connector from motor. Then start to operate indoor unit with remote control.
Is it possible to rotate cross-flow fan by hand properly?
NO
Fan motor operates normally.
Turn off indoor unit and rotate cross-flow fan by hand when the unit is on standby. At this time, is it possible to detect DC 1V or more between ⑤⊕ and ③⊖ of motor connector (CN10).
NO
Start to operate the indoor unit in except heating operation. At this time, is it possible to detect DC 1V or more between ⑤⊕ and ③⊖ of motor connector (CN10)? (Check this condition within 15 seconds after starting unit.)
NO
YES
YES
Replace bearing.

(4) Indoor fan motor starts rotating by turning on power supply alone. (For 16k)

<Cause>

The IC is built in the indoor fan motor. Therefore the P.C. board is also mounted to the inside of the motor.

If the P.C. board is soldered imperfectly or the IC is defective, the fan motor may automatically rotate by turning on power supply.

<Confirmation procedure>

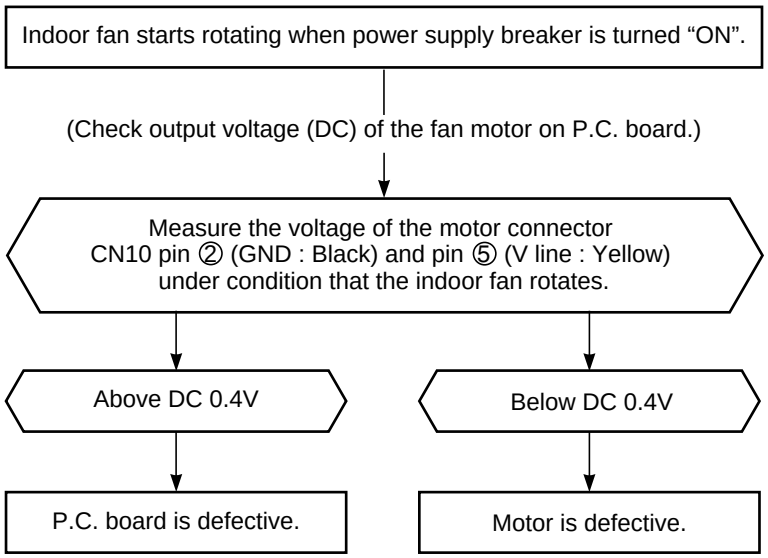
(1) Remove the front panel.(Remove 4 screws.)

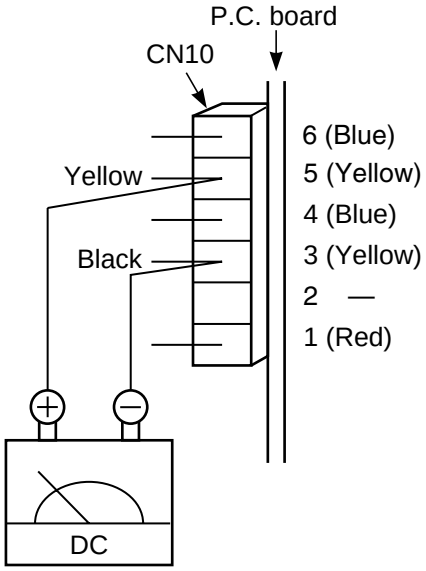
(2) Remove cover of the fan motor lead wires.

(3) Check DC voltage with CN10 connector while the fan rotating.

NOTE :

- Do not disconnect the connector while the fan rotates.
- Use a thin tester rod.


Indoor fan starts rotating when power supply breaker is turned “ON”.
(Check output voltage (DC) of the fan motor on P.C. board.)
Measure the voltage of the motor connector
CN10 pin ② (GND : Black) and pin ⑤ (V line : Yellow)
under condition that the indoor fan rotates.
Above DC 0.4V
Below DC 0.4V
P.C. board is defective.
Motor is defective.



8-8. How to Check Simply the Main Parts

8-8-1. How to Check the P.C. Board (Indoor Unit)

(1) Operating precautions

1) When removing the front panel or the P.C. board, be sure to shut off the power supply breaker.
2) When removing the P.C. board, hold the edge of the P.C. board and do not apply force to the parts.
3) When connecting or disconnecting the connectors on the P.C. board, hold the whole housing. Do not pull at the lead wire.

(2) Inspection procedures

1) When a P.C. board is judged to be defective, check for disconnection, burning, or discoloration of the copper foil pattern or this P.C. board.
2) The P.C. board consists of the following 2 parts

a. Main P.C. board part :

DC power supply circuit (5V, 12V, 35V), Indoor fan motor control circuit, CPU and peripheral circuits, buzzer, and Driving circuit of top/bottom louvers

b. Indication unit of infrared ray receiving Infrared ray receiving circuit, LED :

To check defect of the P.C. board, follow the procedure described below.

(3) Checking procedure.

(For 10/13k)

Table 8-6-1

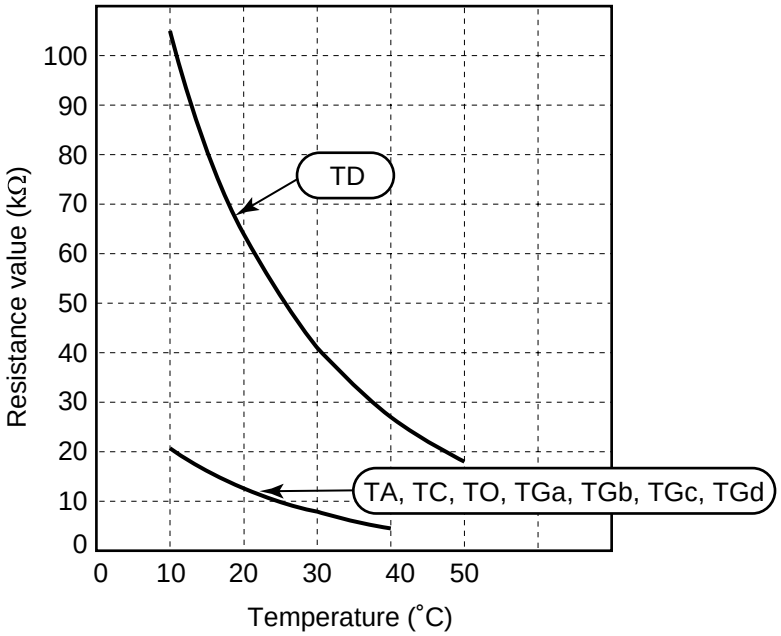
No.	Procedure	Check Point (Symptom)	Causes
1	Shut off the power supply and remove the P.C. board assembly from the electronic parts base. Remove the connecting cable from the terminal block.	1. Is the fuse blown?	1. Application of shock voltage. Overload by short-circuit of the parts.
2	Remove the connector for the motor, and turn the power on. If the OPERATION lamp blinks (0.5 sec. : ON, 0.5 sec. : OFF) when the power turning on, the checking points described as 1-4 of right column are not necessary to perform.	Voltage check 1. Between F01 and CN23 (AC 220 ~ 240 V) 2. Between + and – of C50 (DC14 ~ 31V) 3. Between 5V and GND 4. Between 12V and GND	1. AC power cord is defective. Poor contact of the terminal plate. 2. Capacitor (C01, C15) is defective. Line filter (L01) is defective. Capacitor (C50) is defective. Diode (DB01) is defective. 3. T01, IC08, IC11 are defective.
3	Start the operation with the system which the time of the restart delay timer is shortened.	1. All indicators light for 3 sec.. 2. Indicators do not indicate normally after approximate 3 sec..	} Defective indicator, or poor housing assembly. (CN13)
4	Make the operation status by pressing once the [⏻] button. 1. The time of the restart delay timer is shortened. 2. Cool operation 3. Air volume [AUTO] 4. Make the setting temperature lower enough than room temperature. 5. Continuous operation.	1. Compressor does not operate. 2. OPERATION lamp blinks.	1. The temperature of the indoor heat exchanger is abnormally lower. 2. Poor contact of the heat exchanger sensor. (The connector is disconnected.) (CN01) 3. Heat exchanger sensor, main P.C. board are defective. (Refer to 4. Main P.C. board is defective.
5	The status of No. 4 is continued, and make the following condition. 1. Heat operation 2. Make the setting temperature higher enough than room temperature.	1. Compressor does not operate. 2. OPERATION lamp blinks.	1. The temperature of the heat exchanger is abnormally high. 2. The heat exchanger sensor connector has short-circuit. (CN01) 3. The heat exchanger sensor is defective. 4. P.C. board is defective.
6	Turn the power on after connecting the motor connector. Start the operation with the following condition. 1. Operation [Cooling] 2. Airflow [High fan] 3. Continuous operation	1. Motor does not rotate. (The key operation is accepted.) 2. The Motor rotates, but it vibrates too much.	1. Poor contact of the motor connector. 2. Fan motor is defective

(For 16k)

Table 8-8-1

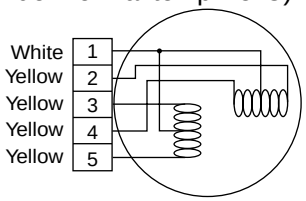
No.	Procedure	Check point (Symptom)	Causes
1	Shut off the power supply and remove the P.C. board assembly from the electronic parts base. Remove the connecting cable from the terminal block.	1. Is the fuse blown?	1. * Application of shock voltage. * Overload by short-circuit of the parts.
2	Remove the connector for the motor, and turn the power on. If the OPERATION lamp flashes (0.5 sec. : ON, 0.5 sec. : OFF) when the power turning on, the checking points described as 1-3 of right column are not necessary to perform.	Voltage check 1. Between [TP1] and [TP2] (220–240V AC) 2. Between + and - of C03 (310 to 340V DC) 3. Between [15V] and [GND] 4. Between [12V] and [GND] 5. Between [5 V] and [GND]	1. * AC power cord is defective. * Poor contact of the terminal plate. * Miss wiring of the power relay. 2. * Capacitor (C01) is defective. * Line filter (L01) is defective. * Resistor (R05) is defective. * Diode (DB01) is defective. 3. Q14, IC08, T01 are defective. 4. IC01, D16, T01, F02 are defective. 5. IC01, IC11, T01, F03 are defective.
3	Start the operation with the system which the time of the restart delay timer is shortened.	1. All indicators light for 3 sec. 2. Indicators do not indicate normally after approximate 3 sec.	} Defective indicator, or poor housing assembly. (CN13)
4	Make the operation status by pressing once the [⏻] button. 1. The time of the restart delay timer is shortened. 2. Cool operation 3. Air volume [AUTO] 4. Make the setting temperature lower enough than room temperature. 5. Continuous operation.	1. Compressor does not operate. 2. OPERATION lamp flashes.	1. The temperature of the indoor heat exchanger is abnormally low. 2. Poor contact of the heat exchanger sensor. (The connector is disconnected.) (CN01) 3. Heat exchanger sensor, main P.C. board are defective. 4. Main P.C. board is defective.
5	Turn the power on after connecting the motor connector. Start the operation with the following condition. 1. Operation [Cooling] 2. Airflow [High fan] 3. Continuous operation	1. Motor does not rotate. (The key operation is accepted.) 2. The motor rotates, but it vibrates too much.	1. Poor contact of the motor connector. 2. Indoor fan motor is defective.

<Sensor characteristic table>



TD : Discharge temp. sensor
TA : Room temp. sensor
TC : Heat exchanger temp. sensor
TO : Outdoor temp. sensor
TGa : Gas side temp. sensor
TGb : Gas side temp. sensor
TGc : Gas side temp. sensor
TGd : Gas side temp. sensor

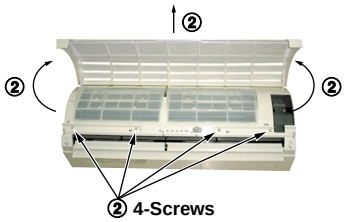
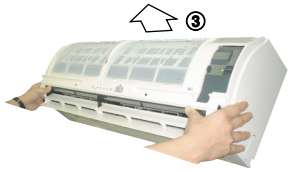
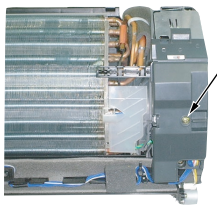
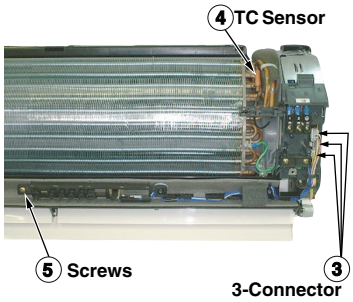
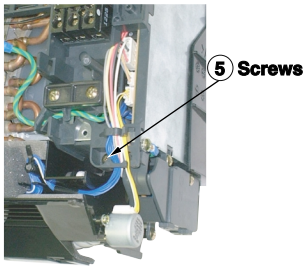
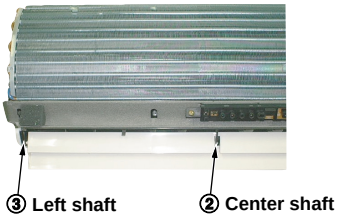
8-8-3. Indoor Unit (Other Parts)

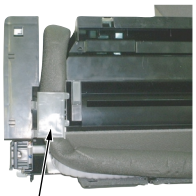
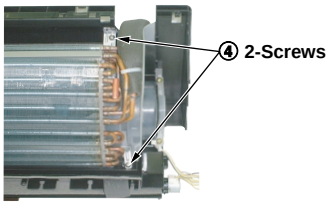
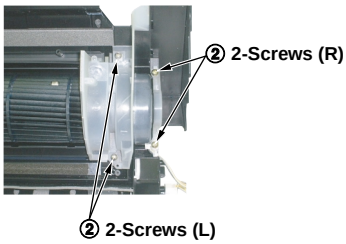
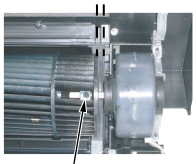
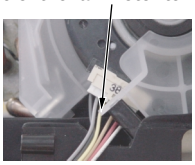
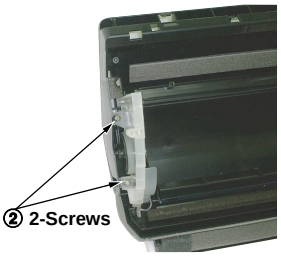
<table>
<tr><th>No.</th><th>Part name</th><th>Checking procedure</th></tr>
<tr><td>1</td><td>Room temp. (TA) sensor
Heat exchanger (TC) sensor</td><td>Disconnect the connector and measure the resistance value with tester.
(Normal temp.)
<table>
<tr><th>Temperature / Sensor</th><th>10°C</th><th>20°C</th><th>25°C</th><th>30°C</th><th>40°C</th></tr>
<tr><td>TA, TC (kΩ)</td><td>20.7</td><td>12.6</td><td>10.0</td><td>7.9</td><td>4.5</td></tr>
</table></td></tr>
<tr><td>2</td><td>Remote controller</td><td>To item of How to judge whether remote control is good or bad of the Judgment of trouble by symptom.</td></tr>
<tr><td>3</td><td>Louver motor
MP-24GA</td><td>Measure the resistance value of each winding coil by using the tester.
(Under normal temp. 25°C)
 

<table>
<tr><th>Position</th><th>Resistance value</th></tr>
<tr><td>1 to 4
1 to 6
2 to 3
2 to 5</td><td>380 ± 10 Ω</td></tr>
</table></td></tr>
<tr><td>4</td><td>Indoor fan motor</td><td>Since judgment of motor is difficult on the single motor, refer to 8-5.</td></tr>
</table>

9. HOW TO REPLACE THE MAIN PARTS

9-1. Indoor Unit

No.	Part name	Procedures	Remarks
①	Front panel	How to remove the front panel 1) Stop operation of the air conditioner and turn off its main power supply. 2) Pull the air inlet grille toward you to open it and remove the air inlet grille. Then remove the 4 screws fixing the front panel. 3) First open the horizontal louver, and then remove the front panel from the back body by pulling it toward you. How to mount the front panel Push the front panel back in and make sure all hooks are locked.	 
②	Electrical part	How to remove the electrical part. 1) Remove the front panel with procedure ①. 2) Remove the screw holding the electrical part cover. 3) Disconnect the 2 connectors (3P) for the fan motor and the connector (5P) for the louver motor from the P.C. board assembly. 4) Pull out the TC sensor from the sensor holder. 5) Remove the screw for the ground connection, remove the screw for the electrical part box and remove the screw from the LED unit. Then remove the LED unit and the electrical part box from the main unit. How to mount the electrical part. 1) To put back the electrical part box, lock it to the upper hook of the back body. 2) Tighten the screw on the electrical part box. 3) Connect the 3 connectors and arrange the wiring same as original condition and then tighten the screw from the LED unit to the back body. 4) Attach the TC sensor to the holder. 5) Tighten the screw for the ground connection. 6) Assemble the drain guide (the TC sensor wire should be covered by the drain guide). 7) Tighten the screw on the electrical part cover.	  
③	Horizontal louver	1) Remove the front panel and the electrical part following procedure ②. 2) Remove the center shaft of the horizontal louver from the back body. 3) Remove the left shaft from the back body. 4) Remove the horizontal louver from the back body.	

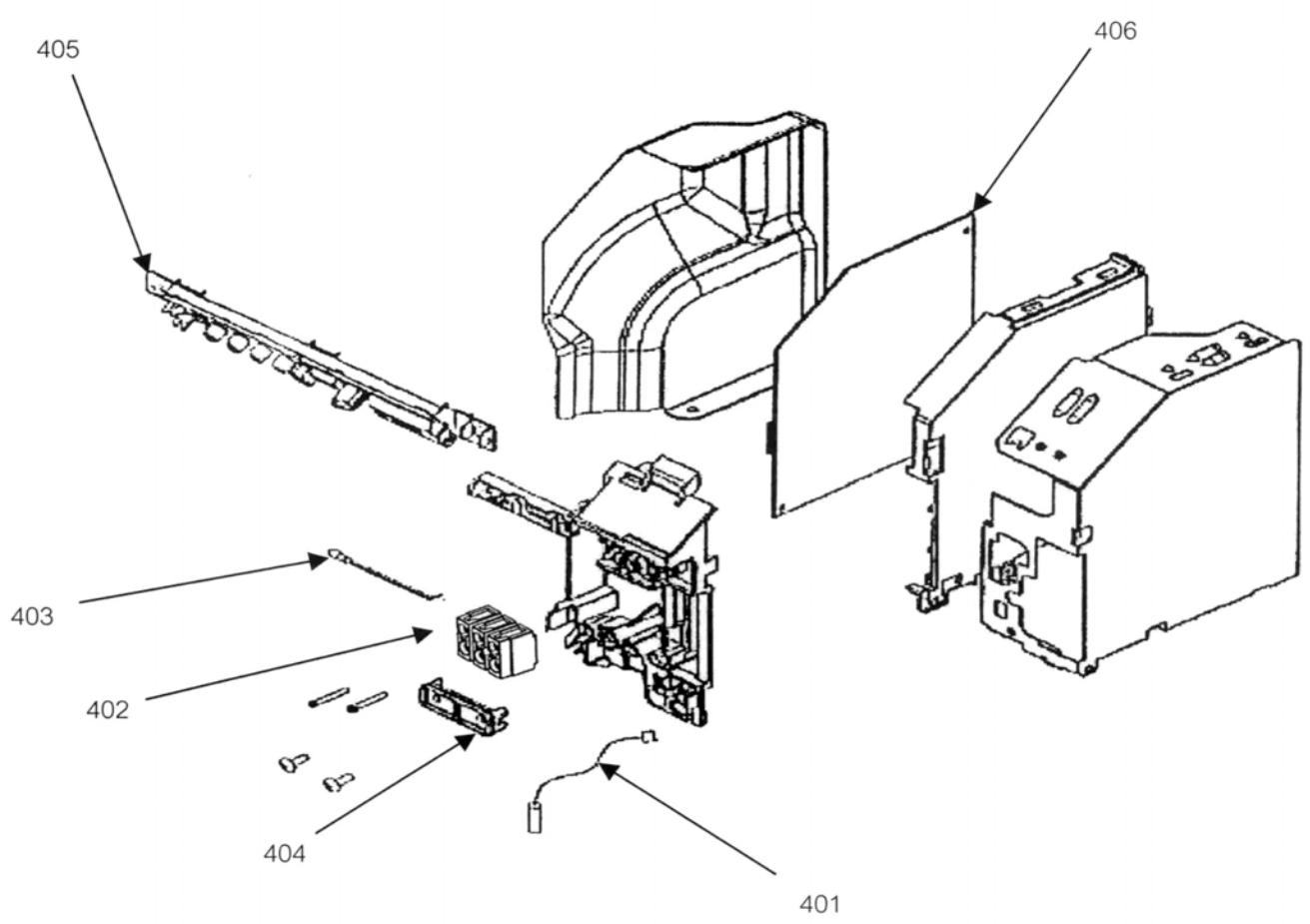
No.	Part name	Procedures	Remarks
④	Heat exchanger	1) Remove the front panel, electrical part and the horizontal louver following procedure ③. 2) Remove the pipe holder at the rear side of main unit. 3) Remove the 2 screws on the heat exchanger at the base bearing. 4) Remove the 2 screws on the heat exchanger at the 2 fixed plates (upper and lower) from the back body, and then pull out the upper side of the heat exchanger slowly.	 ② Pipe holder ③ 2-Screws  ④ 2-Screws
⑤	Cross flow fan	1) Remove the front panel, electrical part, horizontal louver and the heat exchanger following procedure ④. 2) Remove the 2 screws on the band motor (L) and remove the 2 screws on the band motor (R) and then remove the cross flow fan. 3) Loosen the set screw of the cross flow fan then separate the fan and the fan motor. **Notice** To assemble cross flow fan and fan motor to the unit, please turn the fan motor unit the center of its terminal meets the lowest point of band motor (R) (point A). Fix the cross flow fan with the set screw at the position where the gap between the back body and the right surface of the cross flow fan is 4 mm.	 ② 2-Screws (R) ② 2-Screws (L) 5 mm  ③ Set screws Middle of the fan motor terminal 
⑥	Base bearing	1) Remove the front panel, electrical part, horizontal louver, heat exchanger and the cross flow fan following procedure ⑤. 2) Remove the 2 screws fixing the base bearing. 3) Remove the bearing from the base bearing. If the housing protrudes from the base bearing, put the housing in position and attach the bearing to the base bearing.	 ② 2-Screws

9-2. Microcomputer

No.	Part name	Procedure	Remarks
①	Common procedure	1) Turn the power supply off to stop the operation of air-conditioner. 2) Remove the front panel. • Remove the two fixing screws. (Ø4 x 14ℓ) 3) Remove the electrical part base.	Replace the thermal fuse, terminal block, microcomputer ass'y and the P.C. board ass'y.

10. EXPLODED VIEWS AND PARTS LIST

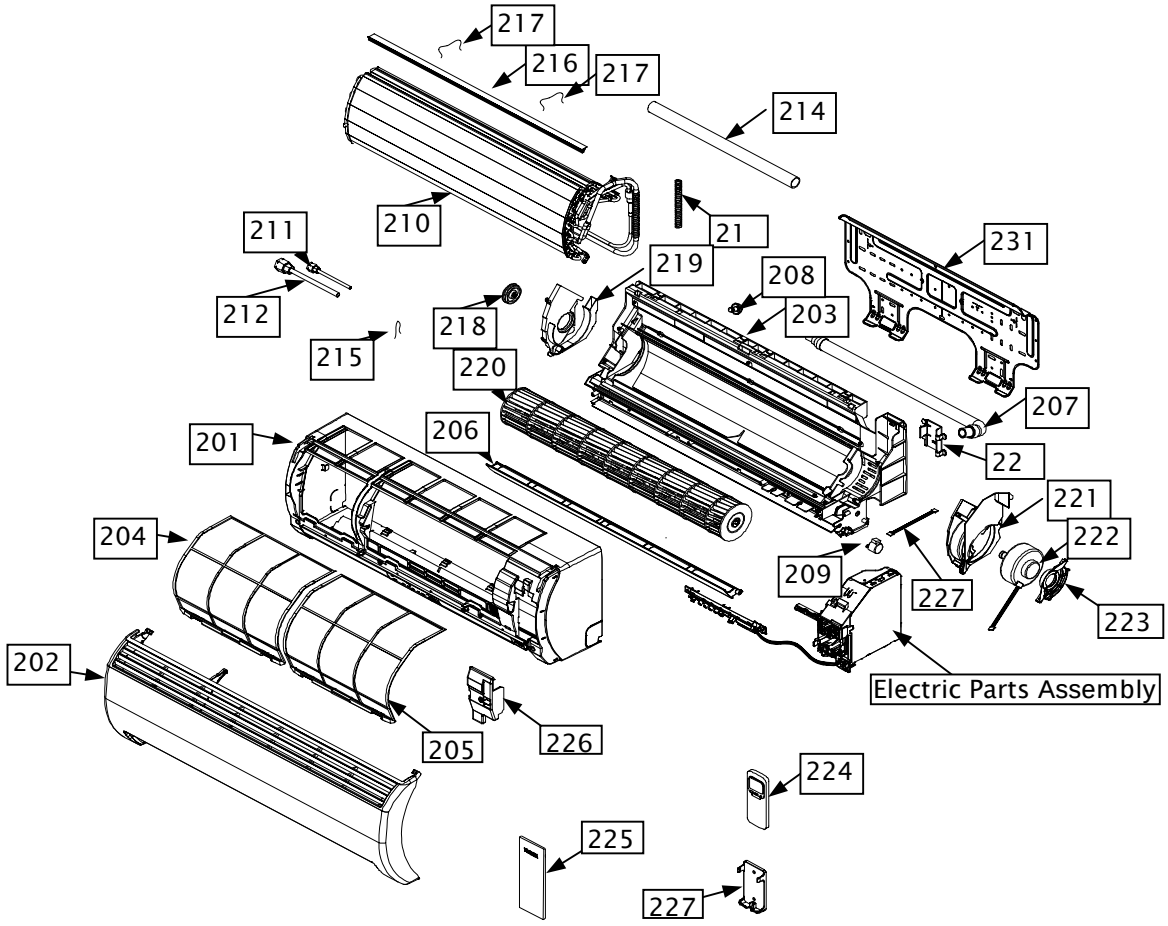
10-1. Indoor Unit (E-Parts Assy)



Location No.	Part No.	Description
401	43T69319	TEMPERATURE SENSOR
402	43T60002	TERMINAL BLOCK; 3P
403	43T69320	TEMPERATURE SENSOR
404	43T62003	CORD CLAMP
405	43T69079	PC BOARD ASSY;WRS-LED
406	43T69332	PC BOARD (FOR RAS-M16NKV-E)

Location No.	Part No.	Description
406	43T69335	PC BOARD (FOR RAS-M16NKCV-E)
406	43T69474	PC BOARD (FOR RAS-M10NKCV-E)
406	43T69475	PC BOARD (FOR RAS-M13NKCV-E)
406	43T69476	PC BOARD (FOR RAS-M10NKV-E)
406	43T69477	PC BOARD (FOR RAS-M13NKV-E)

10-2. Indoor Unit



Location No.	Part No.	Description
201	43T00413	FRONT PANEL ASSY (FOR RAS-M10,13,16NKCV-E)
201	43T00414	FRONT PANEL ASSY (FOR RAS-M10,13,16NKV-E)
202	43T09342	INLET GRILLE ASSY
203	43T03316	BACK BODY ASSY
204	43T80311	AIR-FILTER(R)
205	43T80310	AIR FILTER (L)
206	43T09328	HORIZONTAL LOUVER
207	43T70002	DRAIN-HOSE
208	43T79301	CAP-DRAIN
209	43T21321	MOTOR; STEPPING
210	43T44364	REFRIGERATION CYCLE ASSY (FOR RAS-M10,13NKV-E, NKCV-E)
210	43T44365	REFRIGERATION CYCLE ASSY (FOR RAS-M16NKV-E, NKCV-E)
211	43T47006	PIPE; DELIVERY
212	43T47005	PIPE; SUCTION (FOR RAS-M10NKV-E, NKCV-E)
212	43T47016	PIPE; SUCTION (FOR RAS-M13,16NKV-E, NKCV-E)
213	43T49009	SPRING

Location No.	Part No.	Description
214	43T11301	PIPE SHIELD
215	43T19302	HOLDER SENSOR
216	43T49302	PLATE OF EVA SEAL
217	43T49006	HOLDER FOR PLATE
218	43T22002	ASM-M-BEARING
219	43T39301	BASE; BEARING
220	43T20302	FAN; CROSS FLOW
221	43T39302	BAND MOTOR-L
222	43T21338	MOTOR FAN
223	43T39303	BAND MOTOR-R
224	43T69422	WIRELESS-REMOCO (WC-H01EE) (FOR RAS-M10,13,16NKV-E)
224	43T69471	WIRELESS-REMOCO (WH-H02EE) (FOR RAS-M10,13,16NKCV-E)
225	43T85410	OWNER'S MANUAL
225	43T85411	OWNER'S MANUAL
225	43T85412	OWNER'S MANUAL
225	43T85413	OWNER'S MANUAL
226	43T62302	TERMINAL COVER
227	43T60317	CORD MOTOR LOUVER
228	43T07303	HOLDER PIPE
231	43T82301	PLATE; INSTALLATION

TOSHIBA CARRIER (THAILAND) CO.,LTD.
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AMPHUR MUANG, PATHUMTHANI 12000, THAILAND.